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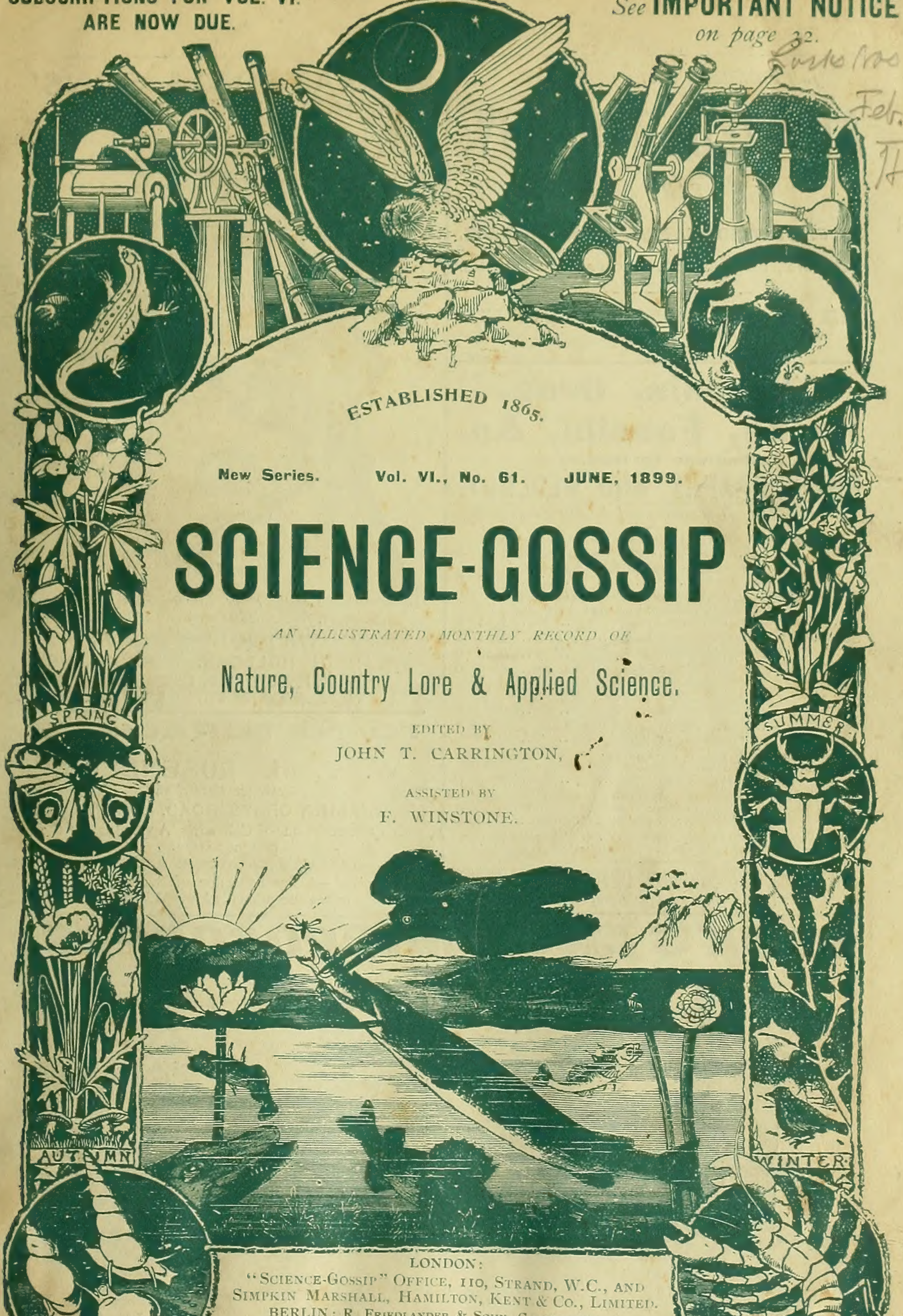

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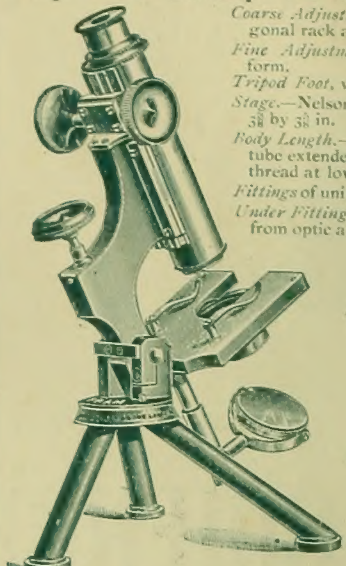

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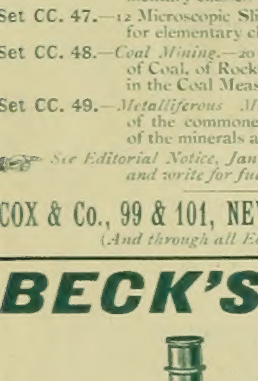

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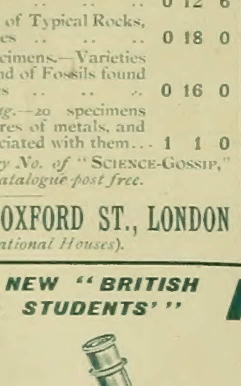

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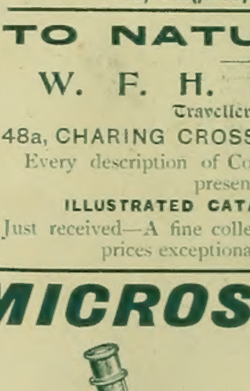

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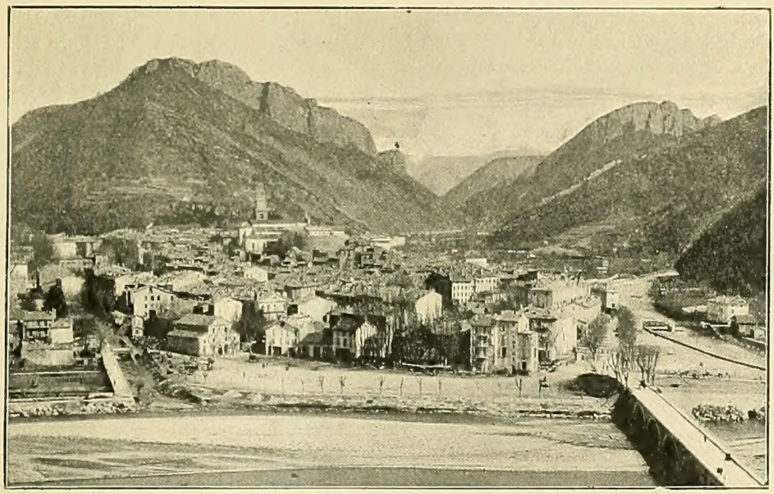
BUTTERFLIES OF THE PALAEARCTIC REGION.

By Henry Charles Lang, M.D., M.R.C.S., L.R.C.P., Lond.

THE Rev. H. C. Lang, M.D., has been good enough to undertake a series of articles for Science Gossip, upon the Butterflies of the Palaearctic Region. Dr. Lang's work on the Butterflies of Europe, issued with coloured plates in 1884, is well-known to every entomologist studying this beautiful group of insects. The species contained in that work will be revised and included herein, the whole forming a manual of Palaearctic Butterflies, with every known species fully described. There will be frequent illustrations, especially of species either hitherto unfigured, or not easily accessible. These figures will be from authentic specimens in Dr. Lang's almost complete collection. The subject, at our request, is treated popularly, though scientifically; as it is intended in addition to students or collectors, for the use of the increasing number of English-speaking persons, who visit the Continent of Europe. Now that the trans-Siberian railway is progressing in construction, these travels will be, in the near future, extended eastward. As no popular manual of the Palaearctic Butterflies exists, we have induced Dr. Lang to include the Asiatic portion of his work.

The author desires to enter into communication with those entomologists who may visit, and collect these insects in little frequented parts occurring on the accompanying map, with a view of recording the accurate distribution of new species, rare or local forms. Dr. Lang's address is All Saints Vicarage, Southend-on-Sea, Essex. These articles are the copyright of the author and Science-Gossip.—[Editor.]



Digne in Provence,
One of the best Localities in Europe for Butterflies.

Introduction.

The Butterflies or Rhopalocera which form a natural section of the great order Lepidoptera will no doubt always be popular with entomologists. Almost annually some work appears entirely devoted to this group, and it seems that even our British Butterflies are not yet likely to cease from becoming the subjects of new monographs.

English entomologists are, however, beginning to recognise that our country is but a small corner of Europe, "The nook-shotten Isle of Albion." Further, that Europe itself is only a portion of one of the great Biological divisions of the world, known to naturalists as the Palaearctic Region. Our small array of sixty or so butterflies will serve as an indication of the general type of what we may expect to meet with on the Continent. The European species again afford us an idea of the general aspect of the rhopalocerous fauna of the whole region.

The Palaearctic Region.

I am often asked, "What is the Palaearctic Region?" This is not a question that is easy to answer in terms of general application. We may define it zoologically as the portion of the Old World whose fauna bears traces of having come under the influence of the Glacial Period. Nevertheless, in different groups of animals the arrangement of the region requires a certain amount of modification. A distribution of territory that would be suitable to mammalia, or to birds, would not necessarily apply

exactly to insects. I intend here to make use of the definition proposed by Mr. Philip Lutley Sclater, Ph.D., F.R.S., secretary of Zoological Society of London, in his article on "The Geography of Mammals" ("Geological Journal," 1897, p. 84). He divides the Region into four groups, viz.—

I. PANARCTIC SUB-REGION.

"Comprising the extreme northern part of Russia and Siberia as far as Behring Strait, the southern boundary of which is the northern limit of trees, corresponding, though by no means accurately, with the Arctic Circle. This part of the old world, together with the most northern portions of the new world, will form one sub-region."

II. EUROPASIAN SUB-REGION.

"Containing the whole of Europe, with perhaps the exception of the steppes of Russia, Siberia north of the great mountain ranges and south of the Arctic sub-region as far as Kamtschatka in the north and northern Manchuria in the south, together with the island of Saghalien, and perhaps the Japanese island of Yezo. In this sub-region must also be included Asia Minor, the Caucasus and the Elburz mountains."

III. EREMIAN SUB-REGION.

"Including the north of Africa, northern Arabia, the greater part of Persia and Afghanistan, and the great desert of Central Asia, extending from the steppes of Southern Russia as far as Manchuria."

IV. MANCHURIAN SUB-REGION.

"Embracing the greater part of China proper, Southern Manchuria and Japan, extending westward to western Tibhet and the top of the southern slopes of the Himalayas."

Such is Mr. Sclater's definition of the Palaearctic Region as applied to the distribution of mammals. This is a convenient and definite plan which I accept for the Butterflies, with the following modifications:—

SUB-REGIONS I. and II. may be taken in their entirety excepting of the Japanese island of Yezo.

In SUB-REGION III. we must exclude the south of Persia, Afghanistan, Arabia and Egypt, because in these districts there is too great a preponderance of Indian, or of African types.

SUB-REGION IV. can only be taken in a limited sense. From the eastern extremity of the northern slope of the Himalayas, a line must be drawn in a northerly direction, so as to exclude China proper, where, so far as Butterflies are concerned, there is too large a proportion of Indo-Australian species. For this reason Japan must also be excluded; though Corea may fairly be admitted into our Region. Syria and Palestine, North Persia, Tunis, Algeria and Morocco, with the islands of Madeira and the Canaries belong to the Palaearctic Region. This, on the map, is the dotted portion south of Sub-regions II. and III.

SUB-REGION I. is prolonged into Arctic America so as to include Greenland, Labrador, and Northern Canada to Alaska. Southward of these the fauna merges into that of the Nearctic Region.

In the vast territory thus indicated, it is needless to say there is the utmost diversity of climate and physical condition. Yet among the Butterflies the "European" type prevails throughout. We have to reckon with plains, deserts, mountains, table-lands and forests; with the shores of the Arctic Ocean; the Littoral of the Mediterranean and of such inland seas as the Caspian, and lakes, such as Baikal and Aral. We have to include in this region places where winter reigns almost supreme and with lands that are favoured with an almost perpetual summer.

The map that is appended for use in the following monograph is adapted from Mr. Sclater's map, illustrating his paper above alluded to, with the modifications indicated.

As regards nomenclature, I have determined in these chapters to adhere to that of Staudinger's Catalogue of 1871; which is generally adopted on the Continent. This system is also used by Rühl and Heyne in their "Palaearctischen gross-Schmetterlinge," published in 1895. In doing this, I know I differ from many English entomologists of repute. At the same time, I avoid the confusion into which we are in danger of falling by the wholly unnecessary, and insular changes many are seeking to bring into the zoological arrangement, and generic and specific nomenclature of Lepidoptera. It seems to me more useful to follow the method employed in other countries of Europe where entomology is understood, at least as well, as it is in England. Inventing new plans of our own that are no more natural than those commonly received throughout Europe, only adds to our insularity, already more than sufficient in such matters. For after all is said and done, zoological nomenclature and arrangement is but an arbitrary expedient to simplify study; and we are helped but little, if at all, by many of the revolutionary changes. Lastly, I think it is of the utmost importance to be in touch with Continental authors.

Therefore, I hope I may be pardoned if I am not willing to accept, for instance, the proposed placing of the butterflies in the middle of the Heterocera, or the change of name of the pale clouded-yellow butterfly to *Eurymus kirbyi* from the old name of *Colias hyale*, by which it was known to our fathers, and to ourselves until recent times.

The Rhopalocera of the Palaearctic Region are contained in ten families.

1. PAPILIONIDAE (British type *Papilio machaon*, the swallow-tail) containing the genera, *Papilio, Sericinus, Luedorfia, Thais, Hypermnestra, Doritis, Parnassius.*

2. PIERIDAE (In Britain the whites, clouded yellows and brimstone). Genera—*Mesapia, Aporia, Pieris, Anthocharis, Zegris, Leucophasia, Idmais, Callidryas, Euremia, Colias, Rhodocera.*

3. LYCAENIDAE (In Britain the hairstreaks, coppers and blues). Genera—*Thecla, Iolaus, Laeosopis, Thestor, Cigaritis, Polyommatus, Lycaena.*

4. ERYCINIDAE (In Britain *Nemeobius lucina*, the Duke-of-Burgundy). Genera—*Polycaena, Nemeobius.*

5.—Libytheidae. Genus—*Libythea.*

6. Apaturidae (In Britain *Apatura iris*, the purple emperor). Genera — *Charaxes*, *Apatura*, *Thaleropis.*

7. Nymphalidae (In Britain, the white-admiral, tortoiseshell, peacock, &c., and fritillaries). Genera—*Limenitis*, *Neptis*, *Hypolimnas*, *Hestina*, *Euripus*, *Vanessa*, *Melitaea*, *Argynnis.*

8. Danaidae. Genus—*Danais.*

9. Satyridae (In Britain, marbled white, meadow-brown, heaths, &c.). Genera—*Melanargia*, *Erebia*, *Oeeneis*, *Satyrus*, *Uphthima*, *Pararge*, *Lethe*, *Mycalesis*, *Melanitis*, *Epinephele*, *Coenonympha*, *Triphysa.*

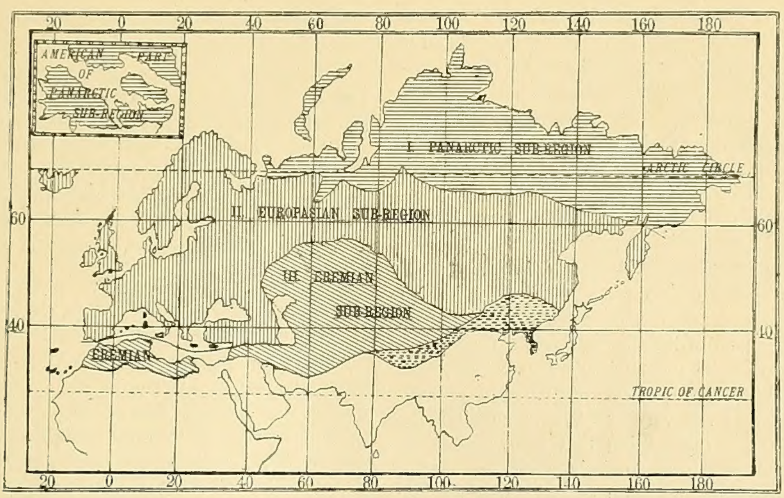
10. Hesperidae (In Britain, the skippers). Genera—*Spilothyrus*, *Syrichthus*, *Nisoniades*, *Damio*, *Eudamus*, *Ismene*, *Hesperia*, *Cyclopides*, *Carterocephalus.*

All these Families are represented in Europe, and In these days of cheap and easy travelling, it is possible to pursue the study of them in a practical manner, which would have been next to impracticable but a very few years ago.

Distribution of Genera.

To enter further into detail concerning the distribution of genera in the Palaearctic Region, we may remark that the genus richest in specific forms is *Lycaena*, which contains more than a hundred species besides many constant varieties. It has representatives in almost every part of the Region, being represented in Britain by our ten species of "Blues" that form the largest generic group of British Butterflies.

Next in order, as regards numerical strength, is *Erebia*, of which, while we have only two species in Britain, *E. aethiops* (Scotch argus), and *E. cassiope* (mountain ringlet), more than half of the Palaearctic species occur in the mountains of Europe, the rest



Map of the Palaearctic Region,
Showing Dr. Lang's Sub-regions.

all but Libytheidae in England (if we accept *Danais erippus* as a British species). Of the sixty-one genera enumerated above, forty are represented in Europe, and twenty-seven in England. Of the remaining twenty-one genera, which are not represented in Europe, only six are exclusively Palaearctic, the remainder resulting from the extension into our Territory of genera properly belonging to other Regions. As examples of these we may cite *Idmais*, *Callidryas* and *Iolaus* in Syria, genera properly belonging to the African Region; *Euripus*, *Lethe*, *Mycalesis*, *Eudamus*, etc., to Corea; *Ismene*, *Damio* and *Sericinus* to the Amur. To these we may add the existence of a single species in Europe of the otherwise African genus *Charaxes.*

It may be gathered from the above remarks that the forms of Rhopalocera with which collectors in our own and adjacent countries are familiar, are for the most part closely allied to what we may expect to find over a vast portion of the surface of the globe.

being furnished by the mountains of Central Asia and Siberia, and the elevated parts of Turkestan and the Amur. *Satyrus* is represented by about fifty species, but does not extend further eastward than the Altai.

Next, as regards numbers, follow the genera *Colias* and *Argynnis*, which from this point of view are about equal. Species of these two genera have been taken between 78° and 83° N. lat., as far north as naturalists have explored. They are well represented in Europe, and are distributed throughout the whole region, even to the Canaries. The deserts and mountains of Central Asia and Siberia, afford many beautiful species of *Colias*, which are absent from Europe.

Nearly equal to these last in numbers is the genus *Melitaea* (*M. aurinia*, the greasy-fritillary, being a familiar British species). This genus is distributed more or less throughout the Region, from Scandinavia and Northern Siberia, to North Africa. Outside the Palaearctic Region there are no species of *Melitaea*,

except in North America. Another numerously represented genus is *Parnassius*, but with only three species in Europe. It is rich in specific forms on the elevated plateaux and mountains of Northern and Central Asia, China and the Himalayas. Several species also occur in the Californian mountains. It is thought that this genus originated in Central Asia, spreading thence eastward and westward, so that it may be said to be particularly characteristic of the Palaearctic Region; it is represented in all the sub-regions. Some genera are absolutely peculiar to the region. Among these may be noticed *Hypermnestra* represented by a single species having somewhat the aspect of a *Parnassius*. It is confined to the Eremian sub-region, inhabiting abundantly the deserts to the east of the Caspian.

The genus *Thais* is remarkable in being confined to those portions of Europe, Asia and Africa, which are in proximity to the Mediterranean. The species of this genus are extraordinarily different from any other butterflies, and do not occur in other parts of the world. One well-marked aberration of a species of *Thais* is absolutely localized in the neighbourhood of Digne in Provence and has never been found anywhere else. This is *Thais medesicaste ab. honoratii*. *Doritis* is a genus of limited distribution, occurring only in Asia Minor, Syria and the Greek Islands. *Thaleropis*, a peculiar genus allied to *Apatura*, is confined to Asia Minor. Among the Pieridae, the central Asian genus *Mesapia* is exclusively Palaearctic, as are also *Thestor* and *Laeosopis* in the *Lycaenidae*, *Polycaena* in the Erycinidae, and *Melanargia*, and *Triphysa* in the Satyridae.

DISTRIBUTION OF SPECIES.

As regards the distribution of specific forms, it is only natural that the most widely distributed genera should exhibit the greatest diversity of species. Having regard to the varying physical conditions of the Region it is not surprising that many species are circumscribed and local in their habitats. Some, however, are distributed more or less throughout the Territory, being capable of adapting themselves to various and diverse conditions, while the former do not appear to have this aptitude. Two species are found in every part of the Palaearctic Region where Butterflies occur. These are both members of the family Lycaenidae *Thecla rubi* (the green-hair-streak), and *Polyommatus phlaeas* (the small-copper).

The following species inhabit the entire region, with the exception of sub-region I. **Papilio machaon* (swallow-tail); *Aporia crataegi* (black-veined white), *Pieris brassicae* (large white), *P. rapae* (small white), *P. daplidice* (green-chequered white), *Rhodocera rhamni* (brimstone), *Lycaena astrarche* (brown argus), *L. icarus* (common blue), *L. argiolus* (azure blue), *Vanessa* **urticae* (small tortoiseshell), *V. cardui* (painted lady),* *Argynnis aglaia* (dark green fritillary), **Argynnis niobe*, *Coenonympha* **pamphilus* (small heath), *Hesperia* **lineola*, **H. comma* (pearl skipper). Those marked * do not occur in the Canaries, and *Argynnis niobe* is probably absent from Britain, but *Vanessa urticae* does occur in sub-region I. in the form of its var. *polaris*, and it is possible *V. cardui* also, as it is an almost cosmopolitan species.

At least six species are limited to the Polar regions, viz., *Colias nastes*, *C. authyale*, *C. hecla*, *Argynnis polaris* and *A. chariclea*; these are all circumpolar, inhabiting the Polar Regions of Europe, Asia and America, *Argynnis improba* Butc., is peculiar to Nova Zembla.

In islands there is always a tendency towards the formation of a fauna peculiar to themselves. This is shown to some degree in the Lepidoptera of the British Isles, more especially among the Heterocera, and in them most markedly in Scotland and Ireland. There are several instances of insularity among British Butterflies. Our form of *Anthocharis cardamines* differs from that usually found on the continent; *Polyommatus dispar*, unhappily now extinct, was peculiar to England, being represented on the continent only by the var. *rutilus*. *Lycaena astrarche* var. *artaxerxes* only occurs in Scotland, and the var. *salmacis* is peculiar to northern England. To these may be added *Melitaea aurinia* var. *hibernica* Birchall and *Coenonympha tiphon* var. *laidion* Bkh., both of which forms are peculiar to Ireland.

The islands of Corsica and Sardinia possess the following species and varieties peculiar to themselves:—*Papilio hospiton* Gn., *Anthocharis tagis* var. *insularis* Stg., *Vanessa ichnusa* Bon., *Argynnis elisa* Godt., *Satyrus neomiris* Godt., *S. semele* var. *aristaeus* Bon., *Epinephele nurag* Ghil., *Pararge tigellius* Bon., *Coenonympha corinna* Hb. (perhaps occurring in Sicily), *Syrichthus sao* var. *therapne* Rbr.

The following are peculiar to the Canaries:—*Pieris cheiranthi*, *P. wollastoni*, *Lycaena webbiana*, *Rhodocera cleobule* and *Pararge xiphioides*.

Whilst on the subject of "insularity," we may notice the tendency to be observed on islands towards a paucity of specific forms; consequent, no doubt, upon being isolated from the mainland, and therefore cut off from recruiting sources. There is no doubt that *Papilio podalirius*, *Polyommatus virgaureae* and *hippothoe*, *Argynnis dia* and *Lycaena semiargus* were truly British insects a century ago. *Polyommatus dispar* has become extinct within the memory of those now living; and the next generation may have to bewail the loss of *Aporia crataegi*, once a widely distributed species. It is doubtful whether it exists at the present moment in any British locality. *Limenitis sibilla*, once described as "common in every wood," is now restricted to the New Forest, and one or two other localities in the south, and will probably in another half century be a stranger to the British Fauna. The same future may also be predicted for *Lycaena arion*, *Melitaea cinxia*, and perhaps even *M. athalia* and *Apatura iris*.

With facts such as these in mind, we cease to wonder at the absence in Britain of so many species that are to be met with commonly in the immediately adjacent Continental districts. If we travel eastward from London, to no greater distance than Penzance would be, had we taken a westerly direction, we should find ourselves in Belgium; where many species of butterflies are common that are not met with in England, or else are very rare. Entomologists had

long hoped to find *Parnassius apollo* in our British mountains, but experience has taught us that the search is fruitless, although our mountains differ but little in aspect from many of those on the Continent, on which *P. apollo*, *Colias phicomone* and *C. palaeno*, besides many species of *Erebia* and *Argynnis* are common, which are here altogether unknown.

LOCALIZATION.

There is a remarkable phenomenon which may be observed even amongst our British Butterflies; namely that of the localization of species, as for instance in the case of *Papilio machaon*, *Lycaena arion*, *Melitaea cinxia*, *Hesperia actaeon*, *Cyclopides palaemon*, etc. We know it is of little use to look for these species, except in the special localities chosen by them as their habitat. We also know that many British species, although widely distributed are only to be looked for in certain circumscribed localities. As examples of these, we may cite such species as *Argynnis paphia*, and *A. aglaia*, *Melanargia galatea*, *Hesperia comma*, etc. Such are certainly not uncommon species, but are not abundant everywhere. Taking the Palaearctic Region as a whole, we find many species localized in a remarkable manner. In many cases we can see that this is the consequence of the local nature of the food plant of the larva. *Hypermnestra helios* depends upon the presence of *Zygophyllum turcomanum*, *Charaxes jasius* on *Arbutus unedo*. *Libythea celtis* is only found where *Celtis australis* is wild. Often however there is not anything to account for the localization of species; the food plant being frequently abundant in places where the butterfly is absent. Two European butterflies *Zegris eupheme* and *Satyrus hippolyte* are found only in Andalusia and in South Russia. It is impossible to account in any satisfactory manner for their isolation in such widely separated localities. .

The selection of food plants is, in itself, one of the unexplained mysteries of nature, nevertheless it is an undisputed fact. Some larvae are very exclusive in their food, others are almost omnivorous, the latter as a rule are those of common and widely distributed species. In respect of food plants, there is often a relation of Zoological to Botanical groups. The larvae of *Thais* and some allied genera are found exclusively on plants of the genus *Aristolochia*; *Parnassius* on Saxifrages and Crassulaceae; the genus *Pieris* and its allies, select plants of the order Cruciferae; *Colias*, Leguminosae; *Vanessa*, Urticaceae; *Argynnis*, Violaceae; the Satyridae on various species of grasses. There is as I have stated above a hidden law of nature which governs this selection; what the effect of it is, upon the configuration of the various groups and species, we do not know, but it is possible that such an effect does exist.

(To be continued.)

TICKS AND "LOUPING-ILL."

By E. G. WHELER.

THE British Ixodidae, or Ticks, are likely to receive far more attention in the future than in the past. Hitherto they have been almost entirely neglected, and it is impossible to obtain much information concerning them. No systematic classification or description of any of the British species in their various stages of development appears to have been attempted.

It seems to have been proved beyond doubt, by the researches of Messrs. Greig-Smith, Meek, and others (see the "Veterinarian," May, 1897, etc.), that through the agency of ticks, a bacillus is introduced into the systems of the hill sheep of the Scottish Borders. This is the cause of the very fatal disorder known in the North by the name of "Louping-Ill," or "Trembling." The disease is analagous to the Texas and Queensland cattle fevers, also to the Australian sheep disease, all of which are similarly traced to the attacks of ticks. It is possible that other diseases may eventually be proved to be caused in a like manner. The life-history of these pests has therefore become a matter of much economic importance, as it may be hoped that, when their habits are thoroughly known, some method may be found, either for preventing, or at least minimising, the damage they occasion.

The following notes have been collected with this object during the last few months, and some descriptions will be given of the various stages of three of the commonest species.—*Ixodes reduvius*, *I. hexagonus*, and *I. plumbeus* (1). The first of which is probably chiefly concerned in causing Louping Ill.

The genus *Ixodes*, or true tick, must not be confounded with the "Sheep Spider Fly," or "Ked," to be found on almost every sheep, and often erroneously called the sheep tick. This is a wingless fly, allied to the New-Forest fly, the grouse-fly, etc., and has nothing in common with the *Ixodes*, either in habits or appearance.

Ixodes may be described as follows:—An oviparous insect (2) passing through the stages of larva, pupa, and adult. The females live by sucking the blood of mammalia, by which their bodies, covered with a tough, membranous, semi-transparent cuticle, are capable of great distension in all stages of their existence. The adult males do not distend, though they equally attack their hosts.

(1) I am indebted to Prof. Neumann of Toulouse for the names of the first two species, and to Mr. R. I. Pocock for the third, taken from a named specimen in the British Museum. There are, however, doubts as to its accuracy.

(2) It is not a *true* insect, having in its maturer stages of life eight legs, and allied to the Arachnidae, or Spiders.

It is doubtful whether the males in the larval and pupal stages are distinguishable from the females, or are capable of distension.

The head is provided with two palpi, caniculated to enclose and protect a strongly-barbed rostrum, by which suction is effected. This is flanked by two retractile chelifers, also armed with

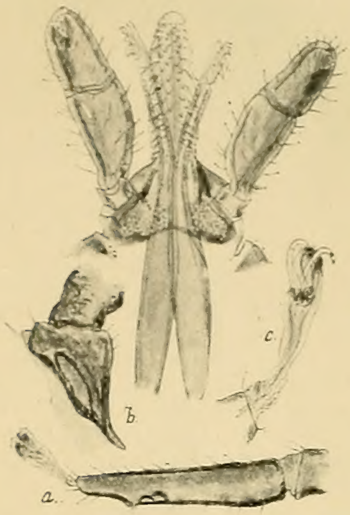


Fig. 1.—Rostrum, etc., of Female I. reduvius.

barbs or hooks, by which the rostrum is forced into the flesh of the host. Respiration is attained through a spiracle on each side of the body, which is absent in the larval stage.

The legs are eight in number in the pupae and adults, but there are only six in the larvae. They consist of six joints, of which the third of each leg, and the terminal joints of the three posterior pairs, possess a double articulation. The last joints of the anterior pair have an organ on the outer side (Figs. 1*a* and 2*a*), which is probably used as a feeler when the tick is resting on herbage, waiting to attach itself to a passing mammal. At such times this pair of legs will be seen to be constantly waved in the air, after the manner of the antennae of insects. In some species this pair of legs is furnished with one or more spines on the basal joint. (Figs. 1*b* and 2*b*.) Each leg has a double hook on the last joint, provided with a fleshy pad, or caruncle. (Fig. 1*c*.)

The difference of the rostrum and chelifers in the two sexes is exhibited in Figs. 1 and 2, the former of which shows those of the female, and the latter those of the male. The difference of the final and basal joints of the fore legs is also shown. These drawings are taken from *Ixodes reduvius*.

The specific differences of the larvae are :—Palpi not articulated. Shield covering less than one-half of the body. Spiracles absent. Three pairs of legs only. (?) Sexes not distinguishable.

The pupae, or nymphs, are more developed generally. They have embryonic articulation of the palpi. Spiracles present. Shield covering less than one-half of the body. Four pairs of legs. (?) Sexes not distinguishable.

The adult ticks are still further developed. The palpi are articulated. Sexes easily distinguishable.

MALE.—Body covered by the shield, a narrow margin excepted. The organs of the mouth are inserted in the female at the time of sexual pairing.

FEMALE.—Shield covering less than one-half of the body. Orifice of sexual organ (Fig. 3) situate between the bases of the fourth pair of legs.

The larvae are easily distinguished by having only six legs and no spiracles. When walking, the first and third legs on one side are raised concurrently with the second on the other, giving a peculiar action.

The pupa, having eight legs, requires, apart from its smaller size, careful examination to distinguish it from an adult female. The chief distinction (Fig. 4) is absence of orifice of sexual organ in the former. The size of the shield distinguishes the adult male as clearly from the female, as from the immature insect. Distension, caused by sucking the blood of the host, takes place in all stages, except with the adult male, and possibly with the immature males.

The exact method of pairing between the sexes is doubtful, but during the act, the chelifers and rostrum are inserted in the organ of the female, the palpi alone being excluded.

As adults, the males are to be found in company with the females, not only on herbage, but also

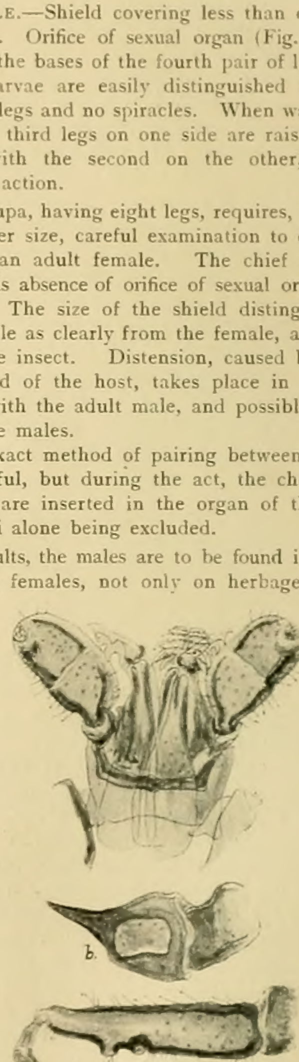


Fig. 2.—Rostrum, etc., of Male I. reduvius.

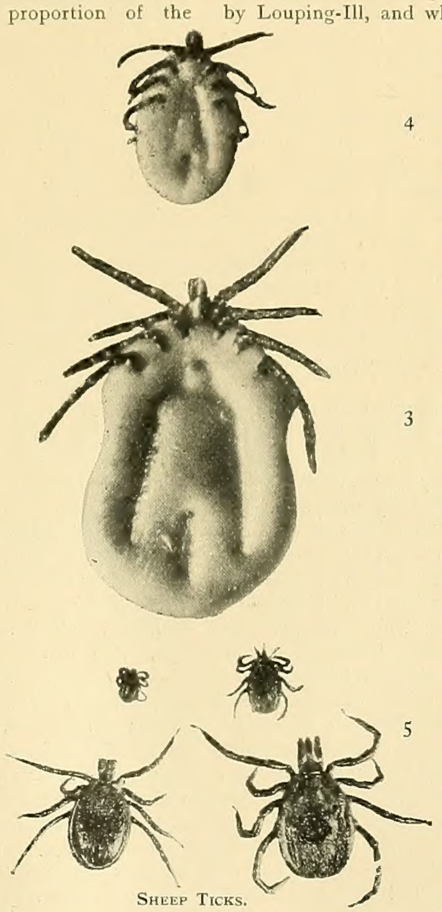
on the host, feeding by the rostrum. This was proved by several adult individuals of both sexes having pieces of the skin of the host still attached to the rostra, after removal, and others having the rostra mutilated by the act of removal. The proportionate sizes of the various stages of growth

are shown by Fig. 5, representing the larva, pupa, male, and female of *I. reduvius*, magnified about six diameters. None of these are distended specimens.

Some females of *I. plumbeus* were taken, fully distended, from a dog on July 15th. On August 4th, twenty days after, one of them commenced to lay eggs, some 100 to 200 in number, under the roots of damp moss. The eggs were oval, about 0.50 mm. in length, and 0.40 mm. in breadth. The female parent remained with them till August 26th, and died on September 27th. The eggs hatched on October 9th, having been nine weeks and three days incubating. A large proportion of the females taken were damaged by having the rostra mutilated by removal from the host. These lived for some time, but never survived the process of laying their eggs, which, moreover, were sterile.

No difficulty has been experienced in keeping alive ticks of all stages of growth, for lengthened periods, in glass bottles with a little damp sand and moss, but development has not been observed to take place under such conditions. If kept without moisture they soon die, but several degrees of frost appeared to have no effect upon adult females.

On September 3rd, a hot and fine day, large numbers of larvae pupae, and adults of both sexes of *I. reduvius* were found with a sweep nét on a patch of rushes. Two pairs of the latter paired in the bottles immediately after capture. On September 26th twenty-six females and seven males were taken from a deer in Alnwick Park, and a largely distended female was impregnated by a male after removal. No ticks were found on a deer killed the previous day in an adjoining paddock.



Sheep Ticks.

The colour of ticks, being partially due to the contents of the intestines, is decidedly variable. Markings which are pronounced in some undistended specimens, are lost very soon after death. During the process of distension considerable changes also take place. The intestinal markings, if any, quickly disappear as it progresses, and when nearly complete a more or less uniform colour pervades the whole body. Thus, slightly distended specimens of the larvae, pupae, and adult females of *I. hexagonus* and *I. plumbeus* are of a pale drab, changing on fuller distension to a dark blue. Adult females of *I. reduvius* change from red to nearly pure white. Under these circumstances, descriptions are apt to be very misleading, unless allowance be made for the amount of development to which the tick has attained.

The object of writing these notes is to call attention to an important but neglected subject, with the hope that others may be induced to study the habits of these pests. The importance of the question is exemplified by the fact that in one spring, no less than 800 sheep were lost on one hill farm by Louping-Ill, and where it is prevalent, certain loss is annually incurred.

Nothing is more inexplicable than the conditions under which animals are, or are not, subject to the attacks of the ticks. Sheep on the hills are evidently very susceptible, when impoverished by the hardship of winter, and the strain on the system caused by the lambing time. On low ground the sheep appear to escape the attack of ticks altogether, though they may be common on other animals. This is analagous to the fact mentioned by Mr. Barber in "Nature" (June, 1895), that in Antigua ticks leave infested cattle when they are changed to a better pasture. On the other hand, I am unable to gather that the poorer sheep on the hills are more susceptible than those in better condition; but have been informed that the contrary is to some extent the case. It is, however, among sheep freshly imported on to "foul" ground that the greatest mortality takes place. A satisfactory explanation of an immunity, which does not seem to depend altogether on the condition of the animal, might go far towards suggesting the direction that experiments should take with a view of minimising the evil.

[Mr. Wheler would be much obliged if correspondents would favour him with specimens, living preferred, of any other British species of the genus *Ixodes*, with particulars of the circumstances under which they were found. His address is Swansfield House, Alnwick.]—Ed. *S. G.*

(To be continued)

COLLECTION AND PREPARATION OF FORAMINIFERA.

By Arthur Earland.

Collecting.

THE three chief sources from which foraminifera may be obtained are :—

1. Dredgings from the sea bottom. With these may be included muds from ships' anchors, or cable grapnels, and the débris from fishermen's trawls.

2. Shore gatherings made between tide marks.

3. Foraminiferous sands, clays and limestones of various geological ages, especially Cretaceous and Tertiary.

The method of preparation is essentially the same for materials of the first and second classes. In dredged material, however, the foraminifera as a rule constitute but a small percentage of the total bulk of the material, globigerina ooze being the chief exception, whilst in shore gatherings the amount of foreign material present, is largely dependent upon the care with which the gathering has been made, and the skill of the collector. In dealing with the fossil materials of the third class considerable deviations from the usual treatment are necessary, varying with the nature and source of the material.

Not many readers will probably have the opportunity of dredging for themselves, but for the benefit of those who can do so, I will describe a modification of the ordinary naturalist's dredge, which will be found necessary for successful work at the foraminifera. The mesh of the ordinary dredge being far too coarse to retain any quantity of sand or mud, it must be surrounded for at least one-third of its length with an outer covering of strong canvas. This must be laced at the upper end to the meshes of the dredge, and extend in a pocket to about eighteen inches beyond the net. The end of this canvas pocket must not be sewn up, but merely tied together with stout cord. After dredging, the sand or mud containing the foraminifera will be found in the canvas bag, and can be removed by untying the cord; the larger organisms being retained in the dredge.

Considerable quantities of mud and sand are often brought up by the flukes of anchors, and on the grapnels used in searching for broken cables. The rubbish from fishermen's trawls is also frequently productive of good material. These sources are closed to collectors who have not special opportunities or means to investigate them. The collection of shore gatherings, however, lies within the reach of any microscopist who passes a few days at the seaside. Although some localities are rich in material while others are poor, there are probably few in which foraminifera are altogether absent from the foreshore.

When walking along the sands between tidemarks, nearly everyone must have noticed the white lines which run along the ripple marks on the sand, and no doubt many have wondered to what they were due. A cursory examination with a pocket lens reveals the presence of many minute shells of a lustrous white colour, with others more or less glassy and transparent, fragments of bryozoa, mollusca, cinders, and other débris. Their presence in these regular lines is due to their low specific gravity as compared with that of the surrounding sand grains. The rocking action of the water at the extreme edge of the retreating tide, brings all such light bodies to the surface of the sand. They are left behind in the long ripple marks; and as the water drains away they sink to the bottom of the furrow. Sometimes the material is to be found in extensive patches, or tiny heaps, where an eddy of the tide has caused it to collect in greater quantities than usual. This is especially the case when isolated rocks project above sand, or in the neighbourhood of groynes or piers.

I have described the deposits as white in colour. This is generally the case, owing to the comparative abundance of the Miliolidae, a family that usually occurs abundantly in shore gatherings, and which are characterised by an imperforate test of an opaque and lustrous white colour, resembling china. Hence the name Porcellanea, applied to the group to which they belong.

In the absence of porcellaneous foraminifera to advertise the presence of the material by their conspicuous colour, the collector must seek other clues to guide him to the spot. The other two divisions into which the order is separated are the Arenaceous and the Hyaline. The first are rare in shore gatherings, while the second, though present in large numbers, are almost invisible to the naked eye, owing to the fact that their shells, when wet, become nearly transparent. On every coast the tide brings to shore large quantities of floating débris of all kinds, which following the same law as the foraminifera, becomes deposited in more or less regular lines upon the sand, and wherever the collector sees such rubbish accumulated, he may expect to find foraminifera. Round our own coasts, and especially in the neighbourhood of the Thames estuary and the entrances to harbours, the débris consists very largely of coal and cinder dust, derived from steamer refuse. This frequently shows up in well-defined black lines upon the sand. One very plentiful gathering which I remember making near Herne Bay, in Kent, in which porcellaneous forms were scarce, was to the naked eye quite black and apparently composed entirely of coal dust.

From what I have already written, it will be seen that a careful examination of the foreshore is a necessary preliminary to any successful attempt at collecting. The deposition of the material is largely dependent upon the action of wind and tide-set in connection with what may be called the local character of the coast-line, the presence

or absence of rocks, groynes, jetties, and such obstacles to the free sweep of the tide. As these conditions are always altering with the season and the weather, what has proved a rich collecting-ground at one visit may be quite bare at another. Still, in every locality there is a focus towards which the drift tends. When this has once been found, as it may be by careful scrutiny of the shore at low tide, the collector can always rely upon finding his material within a short distance, in one or other direction.

A sandy beach in the neighbourhood of a submerged reef of rocks forms the best collecting ground, especially when the sea in the neighbourhood is shallow and the bottom muddy. When the water immediately off shore is deep the shore gatherings will, as a rule, be poor, although dredgings made off the coast may contain abundant foraminifera. Where the beach consists of shingle it is, of course, useless to look among the pebbles for foraminifera, but in such cases there is frequently a lower beach of sand or mud exposed at low water, that may be profitably examined. At Bognor, in Sussex, for instance, the lower beach abounds in foraminiferous material, derived, no doubt, from the extensive ledge of submerged rocks lying off the coast.

A suitable locality having been found, the collection of the material is quite a simple matter. The apparatus required consists of an old spoon, a glass slip 3in. by 1in., or other convenient size, and a piece of zinc or tin with three sides turned up, the fourth side being sharp. The spoon is used for scraping material from the bottom of the ripple marks or rock pools, the glass slip and metal tray for gathering it from patches or heaps, the slip being used as a scraper to brush the sand into the tray, which thus forms a miniature dust-pan. Care must be taken to remove only the surface layer, as this alone contains foraminifera. The material as gathered should be emptied into a calico bag, through which the bulk of the water will drain, or if preferred, a tin can be employed. On reaching home the material should be thoroughly dried by a very moderate heat, or exposure to the sun and air, and it may then be put aside in bottles or boxes until such time as it is convenient to undertake the second stage, the cleaning of the material, and the separation of the foraminifera from the accompanying débris.

(To be continued.)

INSTITUTION OF ELECTRICAL ENGINEERS.—The Institution of Electrical Engineers has arranged for its members to professionally visit Switzerland in September next, where inspection will be made of the many important electrical works and installations in that country. Among the more important of the latter are the railways, tramways, and electric lighting stations, in the neighbourhood of Zürich. The annual conversazione of the institution will be held at the Natural History Museum, Cromwell Road, on the evening of the 15th of June.

THE NEW MUSEUMS.

HER MAJESTY THE QUEEN is to be congratulated upon living to see the approaching consummation of Prince Albert's enlightened plan for Science and Art teaching in this country. In laying the foundation stone of the new museums at South Kensington on the 17th of May, it may be said the last official act of the Queen has been performed in this connection; as it is scarcely to be expected that Her Majesty will attend the final opening ceremony. It is to be hoped that her representative may then be the Prince of Wales, who has always exhibited such keen interest in the educational institutions of his country.

When the whole scheme is complete it will form an association of buildings devoted to Science and Art, which may be described as magnificent. It will include on the eastern side of Exhibition Road, the extensive galleries, courts, libraries, and other departments devoted to Art. On the south of the western side is the beautiful Natural History Museum, for which Owen so long contended, so excellently arranged by Sir William Flower, and now in the hands of his able successor, Dr. Ray Lankester. At the rear of this building and facing Imperial Institute Road is to be erected the Royal College of Science, on a scale hardly less extensive than its opposite neighbour, the Imperial Institute. It is to be hoped that this latter building, hitherto so far from a success in its original intention, may be pressed into the educational group; as the headquarters of the London University. Beyond the Imperial Institute is the Royal College of Music, the City and Guilds of London Institute for Technical Education, and lastly the Albert Hall, to the extreme north. Towards the object of completing the South Kensington Buildings, Parliament, in the Session of last year, voted in a sum of £2,500,000 for various public buildings, no less an amount than £800,000. £500,000 of this will probably be used on the Art side, and the remaining £300,000 on the Science buildings. This is most satisfactory, for if we consider the latter sum to be taken on account, which will probably be the case, we trust that science in London may in the fulness of time, be able to hold up her head with regard to the accommodation for her housing, with the best of cities abroad. This unfortunately at present is far from being the fact, although in latter years we have made such excellent strides in England, not only in science teaching; but also in discoveries resulting from scientific investigation.

The only discordant matter in connection with the South Kensington Science and Art scheme, appears to us to be the unfortunately long, not to say unwieldy title that has been chosen by the powers that be for this group of buildings. We refer to the association of the names of Victoria and Albert in the title. One would not for a moment desire to minimise the interest and influence that have been brought to bear by the Queen and her lamented Consort, in promoting the Science and Art Building at South Kensington; but a time will come when a shorter title will be needed.

INSTINCT.

By R. Dickson-Bryson, B.A., F.P.S., F.R.As.S.

(Continued from Vol. V., page 305.)

In Spiders.

THE spinning faculty being that most intimately connected with the conception of a spider, it was easy and natural for the imaginative Greeks to adopt it as their symbol for a woman. Despite its evil reputation and false celebrity of ugliness, we, who think of single ladies as spinsters, naturally associate the spinder or spider with them. Unfortunately for the reputation of both spiders and women, we can never observe the skill and art displayed in the construction of the web, but we instinctively think of the purpose for which they are employed. Spiders are not classed with insects, from which they differ in having simple eyes instead of compound, eight legs in place of six, no antennae, and not undergoing the metamorphoses so characteristic of insect life. They are distributed into two classes: *Pulmonaria*, or those which breathe by pulmonary cavities; and *Trachearia*, or those that breathe by trachea, like insects. They are classed according to their habits, as Hunters, Wanderers, Sedentaries, and Divers.

The instinctive qualities are well-defined in the spider family, and their study is an agreeable occupation. The spider's web may be studied anywhere, but that of the garden spider (*Epeira diadema*) is perhaps best known. The garden or diadem spider is easily recognised by the beautiful white markings on its body, and by the dark bands and spines on its legs.

The web is an example of rare geometric skill, and is made up of base lines radiating from a common centre, with concentric polygonal spirals winding to a distance of several inches from that point. At the centre the spider takes its sentinel post. Carefully examine the individual threads with a lens and the concentric threads will be found more glutinous than those radiating from the centre. Place them under the microscope and thousands upon thousands of globules will be traced along its length. These globules constitute points of attachment, by which the concentric threads are fixed to the radiating ones. A single web of the garden spider has been found to contain as many as 90,000 of these globules. The web of the *Epeira apoclisa*, an allied species, usually consists of twenty-six radiating lines, and twenty-four rows of spirals. A large web has been estimated to contain 120,000 globules. Besides the radiating and spiral threads there are the base lines extending beyond the outermost circle and fixed like a cable to leaves and branches, so as to support the whole.

A complete web, with its elaborate tracery of radiating and circular lines and myriads of globules is produced in little less than forty-five minutes. In this brief time the spider not only arranges the warp and woof, with the utmost mathematical precision, in their proper places, but knits and spins the whole from its own body. Carefully examining a single thread, we are at once struck with its inconceivable tenuity. Anything beyond a rough estimate of its actual diameter is hopelessly outside our powers. The thread is not, as we view it with unassisted vision, a single fibre, but is composed of strands, twisted and spun together like a rope. A rope, however, is composed of only four or five strands, and here the analogy fails. As many as four or five thousand strands enter into a single spider's thread. Some of these complex threads are so extremely fine that 4,000,000 of them spun together would scarcely equal in thickness an ordinary human hair. Yet each of these 4,000,000 threads is composed of 4,000 others. The diameter of a single strand is therefore the sixteen thousand millionth $\left(\frac{1}{16,000,000,000}\right)$ part of the thickness of a single human hair. Such a statement seems reckless and utterly beyond credibility, but the fact is one of the many marvels abounding in lower forms of life.

The spinneret is another marvel. This curious mechanism is found on the lower posterior surface of the spider's body. Careful inspection of this part will reveal six small tube-shaped prominences. On the apices of four of these prominences will be found a number of minute openings—about a thousand of each. Through each of these apertures the spider ejects a fine viscid substance which hardens on exposure to the air. These twisted together form one of the threads in the web. The four tube-like prominences are called the spinneret. The remaining pair differ in structure and function. Two kinds of thread are produced by the spinneret. The concentric threads possess a viscidity not found in the radiating threads. The incautious insect alighting on the trap is glued down and held fast till the spider overpowers it in its meshes. But whence does the spider procure its material to spin? Behind the spinnerets are six or eight reservoirs, in which a glassy-looking substance is formed and stored till required. A comb-like apparatus on the feet is used to spin, card, and adjust the threads as they issue from the pores of the spinneret. This example of animal machinery exceeds in complexity any of the devices of man's ingenuity for a similar purpose.

The mason spider, with an organisation almost similar to that of the *Epeira*, has very different

habits. It scrapes a small cavity in the earth, of which it makes a home. The interior is lined with its soft web. It then kneads small quantities of earth to make a door. These doors are composed of alternate layers of spider's silk and soil, usually fifteen of each. These layers of silk are so united to the lining of the wall as to form a self-closing hinge. The mason spider never weaves a web like the garden spider, and the garden spider never becomes a mason. Each species is confined to its own special activities.

In this inborn ability of the spider, and especially in the necessary connection between the secretion of the substance of the thread and the construction of the web, we have a manifestation of instinct. The spider weaves its web as the bird builds its nest, but it produces the material, while the bird borrows it. The spider is an animated loom, a machine functioned for automatic action. It requires no engineer to control its movements. The spider is unable to avoid the necessity of weaving; the spinning of its web is a necessity of its being.

BEES.

The same fatality and necessity are found in the instinct of the bee. This interesting creature

SPINNERET OF SPIDER *(Magnified).*

secretes the wax of which its cells are made. It is not prepared from any extraneous material; it is a natural product. The insect's will, if that be imaginable, has no share in its production, no more than in any other excretion or secretion. The wax exudes spontaneously from between the segments of the abdomen.

Among insects the body is divided into three parts—the head, the thorax, and the abdomen. They have six feet, compound eyes, and two antennae, these two latter being analogous to delicate horns, and serving, as some think, the purpose of "feelers." Many are provided with wings, and all undergo a process of metamorphosis more or less complete. That is, when the young emerge from the egg they have not that definition under which they are familiar to us. Thus the butterfly begins active life as a caterpillar, and the bee as a tiny grub.

Among hive bees instinct is manifested from the dawn of their existence, in the social habit. A single female gives birth to an entire population, numbering no less than from eight to ten thousand individuals. That numerous progeny is reared in the same hive, and never separates on reaching the adult state. They form a new society or swarm of their own. Association is the absolute condition of their existence and of the execution of their various labours. Nothing can possibly destroy the obligatory nature of their communal life. We never see a solitary bee construct a hive and prepare honey, although it would be well able to produce both wax and honey. Besides, we may ask, for whom is all this labour—for whom the hive and the honey? What is the *motive* of their ingenious and resourceful activity, if not the rearing the young members of the community? The female bee must be impregnated, and her fertility producing several thousand eggs, a single pair of bees would never suffice to feed and give attention to ten thousand young ones. Association is therefore absolutely necessary. No parliament conceived and formulated their statutes. They are coeval with their own existence.

There are occasions when animals form associations which appear to be the result of deliberation. Beavers associate, for instance, to construct their huts and dams; wolves, when driven by hunger, concentrate their forces to attack a more formidable enemy; birds assemble to perform their annual migrations. There are, we admit, associations provoked by necessity either for defence or attack, or to satisfy a pressing need, or to avoid a particular danger. The wolf once satisfied, the swallow arrived at the end of his journey, the beaver having achieved his purpose—in a word, when the want has been supplied, the danger removed, and the difficulty overcome, the social state is dissolved, and the animals return to their ordinary modes of existence. The social state of the bee, on the contrary, is permanent, because the whole economy of the hive depends upon their social constitution.

For ages, poets and naturalists have vied with each other in their descriptions of the bee. The fourth Georgic of Virgil is a treatise on the management of bees. Their habits, economy, polity, and government, are described with the utmost fidelity, and with all the charm of poetry.

FOOT OF SPIDER *(Magnified).*

In minor matters Virgil is not quite accurate, but how could he be otherwise, ages before the microscope? The habits of the bees, however, were the same in his day, as now. They have always been subject to inflexible laws.

The instinctive characters of the bee are well seen in the construction of the comb. This case

deserves particular consideration, inasmuch as we have evidence of *mind*. The hypothesis that pressure upon a cylindrical cell produces the hexagonal form is insufficient; we must account for the highly artificial mode of termination of the cell by those rhombs inclined at the precise angle (70deg. 31 min.) that calculation requires for the minimum surface, which is also the acute angle of the rhomb. This circumstance points to a highly intellectual operation, implied in the arrangements of its organs so as mechanically to effect it. The worker bees only, are able to construct the cell, and their functions are obligatory, because they alone possess the organ for that purpose. The posterior pair of legs have small cavities into which the bee collects the pollen, while the lower surface is hairy and serves the part of a brush; the mouth is so constructed as to fulfil the office of several instruments; and, lastly, they carry in the space between the four last rings of the abdomen, the organs which secrete the wax. All is determined, provided, and fatal. The functions are not voluntary; they are the result of adaptation. The worker bee is well named—it alone works, and in order that it may not be interrupted in the performance of its duties, natural celibacy is the consequence of its organisation. This last negative condition cannot be explained by natural selection. Could there be a more singular paradox than the conservation by heredity of the unfitness for fecundation? The functions of the male and female are likewise unique and predetermined. The male fecundates, the female lays eggs, and the neuters share the government and the care of the colony.

The social constitution, the diversity and number of individuals, the adaptation of organs to special ends, the different phases of the evolution of the swarm, the perfectness and the invariability of the work: all bespeak instinct.

In the finished hive nearly 50,000 cells await the eggs of the female. She, on her return from her aërial journey, runs over the comb and examines attentively each cell, and if found satisfactory, deposits in each an egg; 15,000 eggs are thus laid, in a single day, and they are arranged in a definite order. The ova for worker bees are first laid, then the eggs for males, and finally those for females. This order is never broken except when the period of fecundation varies. This is neither foresight nor a voluntary act. While engaged in these duties the mother bee is the object of attention and solicitude—I had almost said of the veneration of the worker bees. From this circumstance Virgil likens her to a king, and we, to a queen.

I shall not follow the swarm in all its phases, nor shall I describe the troubles that frequently invade the hive, my purpose being merely to review the peculiar traits of the life and the habits of animals which are instinctive.

(To be continued.)

A HISTORY OF CHALK.

By Edward J. Martin, F.G.S.

AMONG the typical forms of rock that constitute the various geological divisions of the earth's crust, the form of limestone known as chalk is one of those most familiar to the public mind. Chalk is so clearly distinguishable from every other kind of rock, that even he who is in no sense a geologist, has not the slightest hesitation in identifying it. It is not, however, always uniform. I have collected specimens of a pure snow-white tint from a pit, at Goldstone Bottom, near Brighton, since filled in, which fell at once into a powder on the application of the slightest pressure. The chalk used for road-making will leave its mark on the hands and clothes, this being due to the fact that it parts with powdery fragments of itself if handled. There is another kind of natural chalk, so hard as to have been used as building stone. This chalk-rock, as it is called, is capable of substitution in building, for some of the harder limestones.

Globigerina from the Chalk.

There is a well-marked zone of this hard chalk, situated between the Middle Chalk and the Upper Chalk, which has received the name of Chalk Rock; since, scientifically speaking, a "rock" may be anything from an accumulation of loose material, to the hardest of hard rocks. It was a similar hard chalk that was used in the foundations of the old monastery, which formerly stood on the site at the corner of Knightrider Street and Carter Street, in the City of London. I had the opportunity of examining these foundations in the year 1885, during the excavation of the site. It was remarkable to notice how the hard chalk, after the lapse of centuries, was apparently as firm as it had ever been. The great slabs of granite, of which numerous fragments were found, were in an advanced state of decomposition, the felspar crystals being in many cases powdered to dust, and the quartz

standing as though in relief; whilst the mica was easily removable by scratching.

It may be safely said that the entire mass of the purest chalk has formed, at some time or other, part and parcel of myriads of living organisms. Fossils are of frequent occurrence in the Chalk, sometimes whole, but as often scattered throughout softer matrix in a fragmentary condition. Such it is, of course, possible to perceive with the unaided eye, and classify accordingly, but taken in the bulk, it is found that fifty per cent. is composed of the apparently unfossiliferous matrix itself, which is more acceptably known as chalk, To the unaided vision it appears to consist of nothing more than mineral particles in a fine state of subdivision. It is only under the microscope that the true meaning of these particles is revealed, the apparently shapeless specks resolving themselves into beautiful forms of once living nature. They are, in fact, the shells, or tests, of myriads of minute, almost unorganised organisms, about one-hundredth of an inch in diameter, belonging to the animal sub-kingdom Protozoa (*first life*). This sub-kingdom contains three sub-classes. One of these, Rhizopoda, branches off into four orders, one of which is the Foraminifera, and to this the minute chalk organisms belong. The classification is as follows :—

PROTOZOA

GREGARINIDAE INFUSORIA RHIZOPODA

MONERA AMOEBA FORAMINIFERA RADIOLARIA

The remaining half of chalk is composed of a great variety of sea-living organisms. Its basis is a fine amorphous powder, whose particles have been derived from the disintegration and decomposition of the shells of molluscs and actinozoans (corals). Contained in this are also found numbers of minute oval, saucer-shaped bodies, known as "coccoliths," of which it would take from 1,600 to 7,000 individuals, placed side by side, to make an inch. These, with their congeners, discoliths, rhabdoliths, and morpholites, have been proved to be of organic origin. Some have apparently formed part of minute protozoans, whilst others are proper to the sea-weeds. Throughout the whole of the chalk, numerous fragments and prisms of shells, corals, polyzoans, sponges, etc., are found; these, although fragmentary, are recognisable. They have contributed by their weathering in cretaceous times, to the formation of the amorphous powder, in which the various remains are now found. The tests of the foraminifera are of a calcareous nature, and the chalk is therefore a true limestone. On the other hand, when we come to examine the flints, we shall find specimens, equally microscopic, of Radiolaria, another order of the Rhizopoda.

In order that these minute representatives of life should be able to form such great thicknesses of chalk, as at East Horsley, in Surrey, where in a boring it was found to measure 817ft., the creatures must have existed in inconceivable numbers. Accumulated in parts at the bottom of a deep sea of 2,000 fathoms there must for ages have been a continual rain of dead shells, leisurely sinking through this depth of water. Arriving at the bed of the ocean they assisted to entomb the remains of other marine creatures, and to form a gradually but very slowly increasing thickness of foraminiferal ooze.

Foraminifera have existed from the earliest geological times, and have left their remains buried in strata of much greater antiquity than the chalk. Large plaster-casts of the numerous species which have been discovered, have been modelled, and these are exhibited to the enquirer at the Museum of Practical Geology, in Jermyn Street, London, where the diversity of their forms may be accurately studied. Popularly speaking, a foraminifer may be defined as a speck of jelly, covered more or less by a minute shell

CHALK PIT AT RIDDLESDOWN, SURREY.
Showing deposited Strata.

containing one or more chambers, the shells being perforated by extremely fine holes (*foramen*, an opening), through which the creature is able to protrude numerous improvised members.

A foraminifer may be more scientifically defined as a sea-living rhizopod, in which the body is protected by a shell or test usually composed of carbonate of lime, but sometimes membranous. The body, however complicated the shell may be, is simply a small lump of granular, gelatinous sarcode, of a highly elastic character, possessed of contractile powers, and generally having a yellowish or reddish tinge. Through the holes in the test, arms and legs of a temporary nature are protruded at will, consisting of extremely long thread-like processes of sarcode, and these have the peculiar property of interlacing and again uniting after emission. In this way they somewhat represent an appearance, in miniature, of an animated spider's web. The only traces of organisation in this lowly creature are what are known as the "nucleus" and the "contractile vesicle." The nucleus is a rounded mass in the interior of the animal, of a granular consistency, and is thought in some way to be connected with the process of reproduction. The contractile vesicle is perhaps the more interesting of the two, in the light of our present knowledge, for in this we appear to have the humblest possible representation of the heart of the higher animals. If the vesicle be watched, in an amoeba, for instance, since in this there is no shell or test to obscure observation, a clear opening seems to make its appearance at a particular place, and gradually expands within certain limits, after which it again contracts in the same gradual manner, until it finally apparently disappears altogether. After a short period of quiescence, it again commences to expand in a similarly deliberate manner, followed by the process of contraction. It is thought that the digestive fluid is forced throughout the organism by the contraction and dilatation of this little spot, undoubtedly a permanent organ. Thus in these lowly animals we find the combined elements of the circulatory and digestive systems of the higher. The thread-like processes which they emit are known as pseudopodia, and throughout these a kind of circulation of minute granules is kept up. Foraminifers are still living in vast numbers, and in numerous species. Amongst the living monothalamous (single-chambered) species may be mentioned *Lagena*, *Gromia*, *Miliola*, and *Orbulina*. By far the greater number are, however, polythalamous, that is, they consist of numerous chambers. Among the better known of these are *Nodosaria*, *Globigerina*, *Discorbina*, the nautiloid shell, *Lituola*, *Textularia*, *Nonionina*, *Rotalia*, *Cristellaria*, *Pulvinulina* and *Orbulina*.

It has been necessary to glance at some of the living species, in order to properly appreciate the formation of chalk. As already pointed out, it is a remarkable fact, that under the microscope a piece of true chalk will resolve itself into countless numbers of these minute fossils, the ancient representatives of some of the species we have just mentioned. *Globigerina bulloides* was apparently a very common foraminifer in cretaceous times, and is found to constitute a large percentage of the whole, in many chalks. On the other hand, occasionally *Textularia* and *Bulimina* are the chief constituents. *Globigerina* is especially abundant in the chalk rock of Berkshire, Buckinghamshire, and Bedfordshire; also in outcrops of the same stratum around the Weald, in the south-east of England. In some phosphatic chalk from Southerham Pit, near Lewes, Mr. F. Chapman found the species of *Globigerina* known as *G. marginata* to be very common, almost to the exclusion of *G. bulloides*, whilst contained in it were no less than forty other species of these minute tests. Most prominent among them were the fossil forms *Textularia*, *Tritaxia*, *Spiroplecta*, *Gaudryina*, *Bulimina*, *Cristellaria*, *Anomalina*, and *Rotalia*.

Some genera, such as *Frondicularia*, *Bulimina*, and *Cristellaria*, are fairly common throughout the whole of the formation. On the other hand, there are certain forms, such as *Nodosaria*, *Polymorphina*, and *Rotalina*, which are mostly found in the upper chalk. The beds at lower levels are more characteristically represented by *Textularia*, *Rotalia*, *Globigerina*, and *Lagena*.

(To be continued.)

NEW FORM OF PRUNUS.

By Bernard Piffard.

Your botanical readers may be interested in the following description of a species of *Prunus* growing wild over an extended area, and in considerable quantity, in this neighbourhood. I have shown it to two leading authorities and both are agreed it is not the common sloe, but they widely differ as regards the species. It is much less vigorous than the common wild plum, and differs from it in the very small blossom and smaller leaves. It differs from the sloe in that it blooms some weeks earlier, and leafs at the time it blossoms. The bark is not black, the previous year's growth being green. It is thornless and less branching.

It extends over a considerable space on some low land through which an extinct river seems to have flowed into the Boxmoor Valley. As the land rises again before the river entered the valley, the space the shrub now inhabits must have formerly been a swamp.

It is needless to say I shall be willing to visit the place with any of your readers who may wish to examine these shrubs. The locality is about half a mile from Boxmoor Station.

Hemel Hempstead.

The Old Physics Garden on the Chelsea Embankment, which was at one time threatened with extinction, is to be in the future under the management of a committee consisting of seventeen persons. The charity and its endowments are to be administered exclusively for the promotion of the study of botany.

ARMATURE OF HELICOID LANDSHELLS

AND NEW SPECIES OF PLECTOPYLIS.

By G. K. Gude, F.Z.S.

(Continued from Vol. V., page 333.)

Plectopylis austeni (1) (figs. 97*a-f.*). Four specimens, three adult, one young, of an unnamed form of *Plectopylis*, differing from all described species, have been kindly placed in my hands for examination by Lieut.-Col. Godwin-Austen, with whose name I have much pleasure in associating this new species. The new shell is allied to *Plectopylis oglei* (figured in Science-Gossip, N.S. iv. (1898) p. 263, fig. 68), but it can readily be distinguished from that species by its concave spire; it is also much smaller and much more flattened. In its parietal armature, it differs in having a short and a long median horizontal fold and a denticle in front of the vertical plate, all of which structures are absent in *Plectopylis oglei*. A comparison of the figures will also indicate differences in the palatal armatures of the two species. *Plectopylis austeni* has further some affinity, as regards palatal armature, with *P. muspratti* (*c.f.*

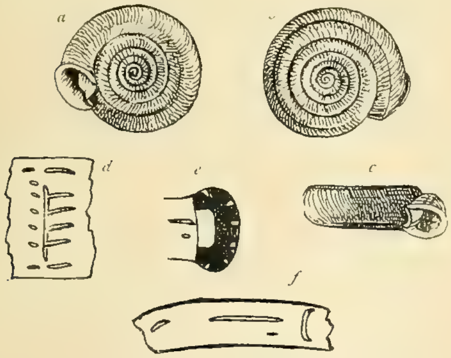


Fig. 97.—*Plectopylis austeni.*

Science-Gossip, N.S. iv., 1897, p. 10, f. 45), but the latter is a dextral species and the parietal armature is quite different, as also in the general shape of the shell. The immature specimen of *P. austeni* referred to above has completed five-and-a-half whorls, and is interesting from possessing two sets of armature a quarter of a whorl distant from each other; these differ considerably from the mature barriers; the parietal armature here consists only of the vertical plate and a very short, slight, horizontal fold in front of it. The palatal armature is similar to that of mature shells, except that the folds, ridge and denticles are very small and slight. Lieut.-Col. Godwin-Austen informs me that the shells were collected by his assistant, Mr. M. T. Ogle, in the Diyung Valley, Singpho, Assam.

Plectopylis woodthorpei (2) (figs. 98 *a-h*). Three specimens—two mature, one young—another undescribed form of *Plectopylis*, have also been most obligingly sent to me for examination by Lieut.-Colonel Godwin-Austen, who informed me that they were collected in 1894 by the late Colonel Woodthorpe, R.E., after whom they are now named. This new species is a very interesting one forming as it does a connecting link between the group of *Plectopylis ponsonbyi* and that of *P. plectostoma*; on the one hand it resembles *P. ponsonbyi* in the posterior portion of the palatal armature (see fig. 98 *f*), and *P. leucochila* in its parietal armature (see fig. 98 *e*); it differs, however, from the other members of this group in having a series of horizontal folds anteriorly to the vertical palatal plate. On the other hand, this biseriate character of the last-mentioned structure, unites it it with the group of *P. plectostoma*. In outward appearance the shell of *P. woodthorpei* much

(1) *Plectopylis austeni*, n.sp. (figs. 97*a-f*).—Shell sinistral, discoid, widely umbilicated, ochreous corneous, covered with a deciduous velvety cuticle; finely and closely ribbed, decussated by raised spiral lines, rather distant on the upper side. One of these spiral lines forms a ridge or keel on the upper angle of the whorls above the periphery, revolving above the suture as far as the third whorl. Spire concave, apex a little raised, suture strongly impressed. Whorls 6½, flattened above, rounded below, obsoletely angulated around the umbilicus; increasing slowly at first, the last widening rather suddenly, and descending half the width of the whorl in front; aperture oblique, cordate. Peristome white, strongly thickened and reflexed, the margins united by a strong raised flexuous concave ridge, slightly notched at the junctions above and below. Umbilicus wide and rather shallow. Parietal armature consisting of a short median horizontal fold close to the apertural ridge, and a second longer one farther back, rather elevated posteriorly, gradually descending on the shell wall anteriorly; below its posterior extremity occurs a small denticle; still farther back is found a strong vertical crescent-shaped plate, the upper and lower extremities of which are deflected posteriorly. Palatal armature composed of six short horizontal folds, the first longest, near the suture, provided at its posterior extremity with an elongated denticle; the second, third, fourth, and fifth a little obliquely depressed posteriorly where they are united by a slight vertical ridge, which is continued above the second and below the fifth folds; on the posterior side occur five elongated denticles, the four lower of which correspond to the four folds, while the fifth is situate near the upper extremity of the vertical ridge; the sixth fold is near the lower suture, and has also an elongated denticle posteriorly.—Major diameter, 17·5-19 millimetres; minor diameter, 14·75-16·5 millimetres; altitude, 5-6 millimetres.—Habitat, Diyung Valley, Singpho, Assam.—Type in the Natural History Museum, South Kensington.

resembles *P. shiroiensis* (*c.f.* SCIENCE-GOSSIP, N.S. iii., 1896, p. 155, f. 20), but the former is much larger. The immature specimen referred to, which has nearly six whorls formed, has the armature incomplete, and is instructive as possibly throwing some light upon the evolution of these structures. The parietal armature here possesses the two vertical plates, but the horizontal folds given off by the anterior plate are very short, being only one quarter of the length of those in the mature shells; the thin fold near the lower suture is not compressed into a lamellar fold below the vertical plates, as is the case in the full-grown shells, and it rises much farther back (see fig. 98 *g*, which shows portion of the parietal wall with its armature). Of the palatal armature, only the posterior series of processes is present, the anterior series having still to be formed: a fact clearly pointing to the more recent origin of the biseriate forms. The vertical plate is distinctly divided into two subequal portions, in consequence of the indentation in the middle being carried down to the base; the ridge connecting the upper extremity of the vertical plate with the short horizontal fold above it is absent, but in its stead occurs near the latter a little denticle; while posteriorly to the upper half of the vertical plate is found a distinct denticle, corresponding to the slight swelling in the same place, mentioned in the diagnosis (see fig. 98 *h*, which shows the inside of the palatal wall with its armature).

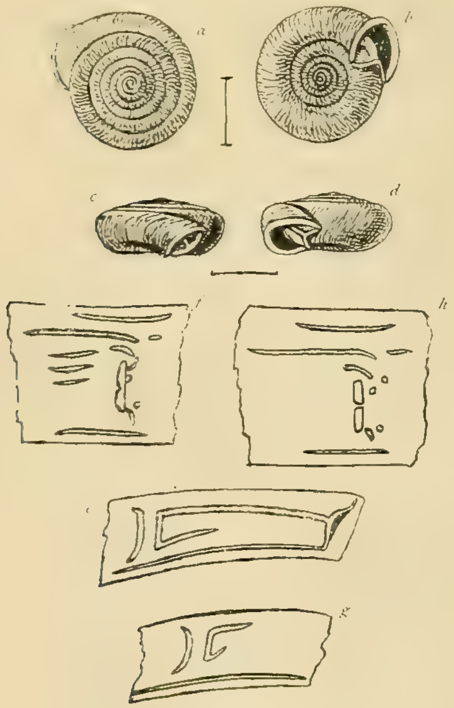


Fig. 98.—*Plectopylis woodthorpei.*

Plectopylis (*Sykesia*) *biciliata* (figs. 99 *a-e*) from Ceylon was described by Dr. Pfeiffer in the "Proceedings of the Zoological Society," 1855, p. 112, as *Helix biciliata*, and the shell is figured in "Hanley and Theobald's Conchologia Indica" (1875), t. 159, figs. 1 and 4. The systematic position of this shell remained uncertain for a long time; it was placed in *Nanina* by Dr. Pfeiffer ("Malak. Blätter" ii., 1855, p. 121), and in *Discus*, by Mr. H. Nevill ("Enum. Helic. Ceylan." 1871, p. 1), while finally Mr. S. Clessin grouped it with *Macrochlamys* ("Nomencl. Helic. viv." 1881, p. 45). It is unfortunate that Dr. Pfeiffer's types of this species cannot be found. They were described as from the late Major Skinner's collection, but Miss Linter who purchased the entire collection, kindly informs me that the shells in question are not in it, and she does not think that Major Skinner ever possessed them there being no record of them in his catalogues. Mr. Edgar Smith

([2]) *Plectopylis woodthorpei*, n. sp. (figs. 98 *a-h*).—Shell dextral, discoid, widely and deeply umbilicated, dark corneous, finely and regularly ribbed, closely decussated by microscopic spiral lines. Spire conical, apex prominent, suture impressed. Whorls 6½, increasing slowly and regularly, flattened above, tumid below, the last scarcely wider than the penultimate, bluntly keeled above the periphery, widening a little towards the aperture, descending deeply in front. Aperture oblique, cordate; peristome whitish, strongly thickened and reflexed, the margins united by a strongly raised flexuous ridge, which is concave in the middle, and notched at the junctions above and below. Parietal armature consisting of two nearly parallel vertical plates, the posterior one longer, slightly reflexed posteriorly at its lower extremity, and provided posteriorly at the upper extremity with a slight ridge; the anterior one shorter, giving off a horizontal fold anteriorly at each extremity, the lower less than half the length of the upper, ascending obliquely; the upper revolving almost parallel with the suture, following the deflexion of the whorl, and joining the ridge at the aperture. Below the posterior vertical plate rises a free, thin, horizontal fold, at first considerably elevated above the shell-wall, but suddenly becoming attenuated and threadlike, running parallel with the lower suture, as far as the aperture where it is joined to the ridge on the parietal callus. Palatal armature in two series, the posterior series consisting of: first, a long thin horizontal fold near the suture; secondly, a very long horizontal fold, extending anteriorly beyond the folds of the second series, with an elevated compressed denticle posteriorly; thirdly, a very short horizontal fold, deflexed posteriorly; fourthly, a strong vertical plate, with an indentation at the middle, giving off posteriorly at its lower extremity an obliquely descending ridge, and provided at the same place with a small denticle; at the base of the upper lobe of the vertical plate on the posterior side occurs a slight swelling, while on the same side from its upper extremity runs a short ridge, connecting this plate with the third horizontal fold; fifthly, a long thin horizontal fold near the lower suture. The anterior series consists of three thin horizontal folds, the first longest the third shortest, all three descending a little anteriorly.—Major diameter, 8·75-10 millimetres, minor diameter, 7·25-8 millimetres, altitude 3·25-4 millimetres.—Habitat, Fort Stedman, Burma.—Type in the British Museum.

has obligingly searched the British Museum collection for these types, but without success. The species appears to be rare, for since it was first described, it has remained unobserved until Mr. H. B. Preston found a single specimen at Patapolla, Ceylon, as recorded by Mr. E. R. Sykes ("Proc. Malac. Soc., London," iii., 1898, p. 66), and Mr. O. Collett subsequently found two

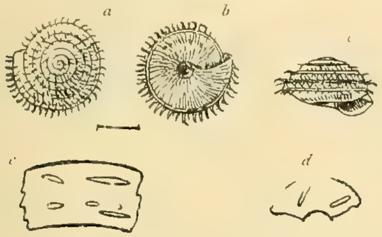


Fig. 99.—*Plectopylis biciliata.*

specimens at Haputale (Sykes, op. cit. p. 160). The three specimens referred to agree with the figures in "Conchologia Indica," and it may, therefore, be safely assumed that they are correctly identified, and to Mr. Sykes belongs the credit of first pointing out the true systematic position of the species. The shell is convexly conical, narrowly umbilicated, dark corneous, translucent, finely and regularly ribbed, with a double keel at the periphery and a third a little above it, the lowest and uppermost being provided with a fringe of coarse, curved, deciduous hairs. There are six convex whorls, which increase slowly and regularly, the base a little shining, tumid around the narrow umbilicus and concave towards the periphery. The aperture is subquadrate, elongated, the peristome simple, acute. The parietal armature consists of two simple obliquely ascending folds, separated by a distance of half a whorl, having the upper extremities somewhat attenuated and the lower truncate. (See fig. 99*d*, which shows the parietal wall with its two folds). The palatal armature is composed of: first, a short, horizontal fold below the periphery, a little farther back but in a line with it a strong lamelliform denticle, ascending obliquely; secondly, three denticles in a line horizontally and about equidistant, the posterior one strongest; thirdly, a short slight horizontal fold near the lower suture, rising near the aperture and revolving as far as the second denticle. (See fig. 99*e*, which shows the inside of the outer wall with the palatal armature). The specimen shown in figs 99*a-c* measures 6 millimetres in diameter, altitude 3·5 millimetres; it is one of the shells collected by Mr. Collett and is in Mr. Ponsonby's collection; the armatures are figured from the specimen collected by Mr. Preston which is in Mr. Sykes' collection.

(To be continued.)

BRITISH FRESHWATER MITES.

By Charles D. Soar, F.R.M.S.

GENUS *LIMNESIA* KOCH.

(Continued from Vol. V., page 361.)

THE next genus that has yielded the largest number of species in this country is *Limnesia*. In this we have six species. Three are very common, but not so the others. There are a great many species known and described from different parts of the world; therefore I do not see any reason why more should not be recorded as British.

The mites belonging to this genus are characterised as having the body soft-skinned, legs well supplied with swimming hairs, and the fourth pair of feet without claws. There are six discs on the genital plates; three on each side. The mandibles are in two portions; eyes wide apart.

I.—*Limnesia histrionica* Hermann, 1804.

Female.—Body: Oval in form. Length about 1·75 mm. Width about 1·40 mm. Colour a bright scarlet, with very dark brown markings.

Legs.—First pair about 1·40 mm. Each pair gradually gets longer; the fourth pair being about 2·20 mm. They are all well supplied with swimming hairs. The first three pairs of feet have claws, the fourth pair have not; but the tarsi are extended almost to a point, near which apex is a strong spur or bristle as seen in fig. 1. The fourth pairs of legs of all members of this genus are modified in the same manner; this applies to males as well as females. This is one of the important points of identification in this genus, but it is not confined to it only, as we shall later see. Colour, blue, sometimes very bright; at others of a slaty tint.

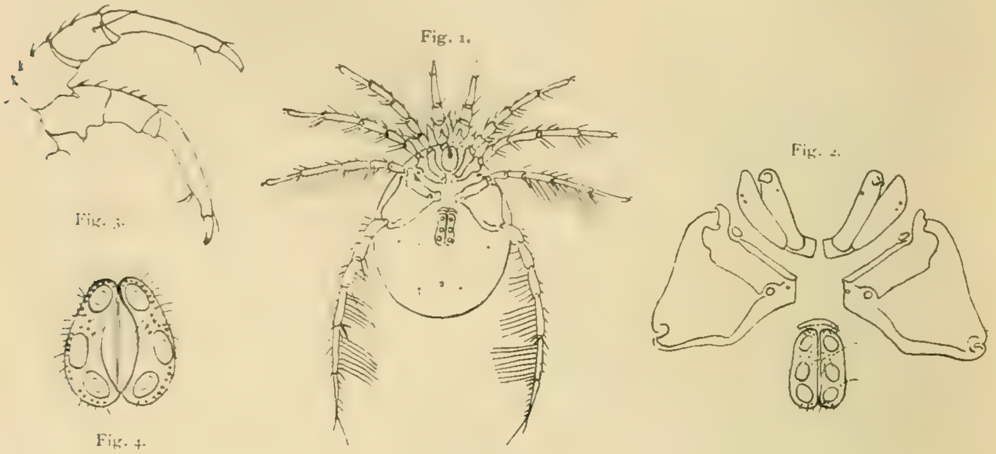
Epimera.—(Fig. 2.) Arranged in four pairs, two on each side of the median line. In colour they are the same as the legs, and all other chitinous parts.

Palpi.—Large and long, about 0·92 mm. in length. On each second segment is a small peg (fig. 3).

Genital Area.—This is composed of two plates. On each plate are three discs, this is no doubt the correct arrangement, but as usual, they vary in number. I am continually finding specimens with two on one plate, three on another, four on one, five on another; and so on. Such irregularity can only be sports. Koenike, in his work on Hydrachnidae of Madagascar, 1898, describes and figures a male and female *Limnesia aspera* with four discs on each plate. I believe this is the only known species that possesses this remarkable distinction.

MALE.—Is a little smaller than female, and has no marked difference, except in the genital plates (fig. 4), which have a fringe of hairs all round the margin.

LOCALITIES.—Common everywhere. I think it one of the most abundant mites we have in Britain. It is piece of chitin, which nearly meets in the centre; but in fig. 5 the corresponding plates are curved in the opposite direction. In identification this is the first point to look for, and is very important; the two mites being nearly the same size and similar in colour.



Limnesia histrionica,
Fig. 1.—VENTRAL SURFACE OF FEMALE. Fig. 2.—GENITAL PLATES AND EPIMERA. Fig. 3.—PALPI OF FEMALE. Fig. 4.—GENITAL PLATE OF MALE.

found in all the ponds round the outskirts of London. I met with them on the Norfolk Broads, and Mr. Taverner has sent me a large number from Scotland. Mr. Halbert has found them in Ireland.

II.—*Limnesia maculata* Müller, 1776.

FEMALE.—Body: Similar in shape to *L. histrionica,* in fact all the members of this genus are very much alike as regards form. So much is this the case that another figure is not necessary. Fig. 1 gives a general idea of the structure of all the species. Length about 1.50 mm.; breadth 1.22 mm.; colour bright red, with very faint markings on the dorsal surface.

LEGS.—First pair about 0·92 mm., fourth pair about 1.68 mm. General appearance similar to legs on fig. 1. Colour a very dark brown, sometimes nearly black.

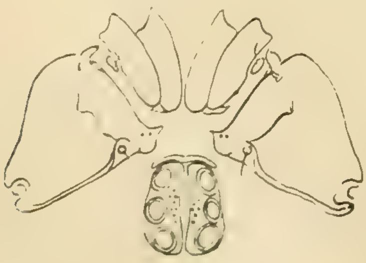


Fig. 5.—*Limnesia maculata,*
EPIMERA AND GENITAL PLATES OF FEMALE.

EPIMERA.—(Fig. 5.) This will show one of the important differences between *Limnesia histrionica* and *L. maculata.* In fig. 2, the first pair of epimera are curved inwards, with a small additional

PALPI.—Small, only about 0·48 mm. in length. This is about half the length of palpi of the first species of this genus. They are also a little different in shape, the peg being nearer the third segment.

Fig. 6.—*Limnesia maculata,* PALPI OF FEMALE.

The hairs on the inner margin are also different, there being several in this species. (See fig. 6.)

GENITAL AREA.—(Fig. 5.) In this species it is very much like fig. 2, excepting that the hairs are placed more in the central portion of the plate; and are a little larger in proportion to the size of the mite.

MALE.—Rather smaller than the female, and possessing nearly the same characters; excepting in the genital plates. Here, a great difference will be found, as shown on fig. 4 and fig. 7. Fig. 4 shows the male plates of *L. histrionica* with a fringe of hairs all round the margin, but the plates of *L. maculata* have not this feature.

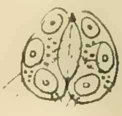


Fig. 7.—*L. maculata,* GENITAL PLATES OF MALE.

LOCALITIES.—Fairly common. I have found them around London, at the Norfolk Broads, and in Suffolk. Dr. George finds them in

Lincolnshire, Mr. Halbert and Dr. Freeman report them from Ireland, and Mr. Taverner from Scotland. This mite is not nearly so common as *Limnesia histrionica*.

III.—*Limnesia undulata* Müller, 1781.

Female.—Body: Similar in form to the preceding species. Length about 1·90 mm. Width 1·50 mm. Colour: yellow, with black markings.

Fig. 8.—*Limnesia undulata*, Palpi of Female.

Legs.—First pair about 1·75 mm. Fourth pair about 2·30 mm. Colour a slaty blue.

Epimera.—Fig. 9 again shows a difference in structure to the preceding ones. The first pair are wider apart, with less curve. In colour they are like the legs, and are a slaty blue.

Palpi.—(Fig. 8.) About 1·10 mm. in length, and possess very little difference from fig. 3, excepting that the hairs on the last segment but one, are set further down the inner edge.

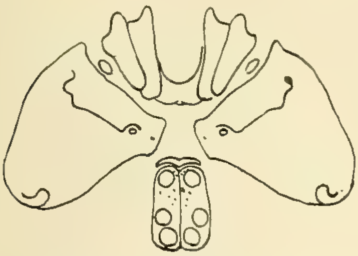


Fig. 9.—*Limnesia undulata*,
Epimera and Genital Area of Female.

Genital Plates.—(Fig. 9.) These are also very distinct from those shown in figs. 2 and 5. In this case the discs are arranged three in each plate as before; but two are near the posterior margin of each plate, and one on each plate near the epimera.

Localities.—This is not a common mite. I have found it on the Norfolk Broads, and Dr. George has sent it to me from Lincolnshire.

IV.—*Limnesia longipalpis* Koch.

Female.—Body: Oval in form. Length about 1.20 mm. Breadth about 1.5 mm. Colour red. One variety is all yellow in colour, with brown markings on the dorsal surface.

Legs.—First pair about 1.10 mm. Second pair about 2.0 mm. Similar in structure to the others of this genus previously mentioned. The red variety has pale blue legs. The yellow form has yellow legs.

Palpi.—It is here we see the distinctive difference' as their length is equal to the first pair of legs, viz., 1.10 mm. (fig. 10). I have found one with the palpi still a little longer.

Fig. 10.—*Limnesia longipalpus*, Dorsal Surface.

I do not think further description necessary for this mite, as the size of the palpi prevents it being mistaken for any other species of this genus.

Localities.—North Wales.

V.—*Limnesia koenikei*, Piersig, 1894.

Female.—Body: Oval in form. Length about 1.20 mm., width about 1.05 mm. Colour, yellow, with dark brown markings. Eyes, a deep red.

Legs.—First pair about 1.10 mm., fourth pair about 1.50 mm., very similar to the legs of all members of this genus. Colour a pale green.

Epimera.—Fig. 11, differ from those I have drawn in the preceding species. The posterior angles are extended much further back, being almost level with the genital plates. The greatest point of difference will be noticed in the position of the discs on the inner angle of the two last pair of epimera. They are quite differently situated to those discs on figs. 2, 5 and 9. The colour is a pale green, same as the legs.

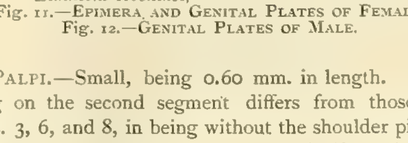


Fig. 11. Fig. 12.
Limnesia Koenikei,
Fig. 11.—Epimera and Genital Plates of Female.
Fig. 12.—Genital Plates of Male.

Palpi.—Small, being 0.60 mm. in length. The peg on the second segment differs from those on figs. 3, 6, and 8, in being without the shoulder piece; the peg coming direct from the limb (fig. 13), and being long and slender.

Genital Area.—Not very different from those before observed in this genus. See figs. 11 and 12.

Localities.—Very common everywhere.

VI.—*Limnesia connata* Koenike, 1895.

FEMALE.—BODY: Rather more circular than in the preceding mites mentioned. Length about 0·76 mm. Breadth about 0·69 mm. Colour, yellow, with darker markings.

LEGS.—First pair about 0.48 mm., fourth pair about 0.80 mm. There is not anything about them requiring a special figure. Colour same as body, yellow, very pale.


Fig. 13.


Fig. 14.

Fig. 13.—*Limnesia koenikei*, PALPUS, SHOWING PEG.
Fig. 14.—*Limnesia connata*, GENITAL PLATES OF FEMALE.

EPIMERA.—Similar in shape to fig. 9, except that the first pair of plates curve under the mouth organs, nearly meeting in the centre. The discs on the inner angle of the last pair of epimera are also placed in a similar position to those on fig. 9 and fig. 2. This will render the identification of this species easy from *Limnesia koenikei* (see fig. 11), for which at first sight it may be mistaken.

PALPI.—About 0·32 mm. Same colour as other parts of this mite.

GENITAL PLATES.—In these will be seen a great difference, the discs being very small (fig. 14), two being close together near posterior margin of plate.

MALE.—This is, as usual, a little smaller than the female, but is the same in all particulars, except in the genital plates. These are very much like the male plates of *L. histrionica* (fig. 4) with the fringe of hairs round their margin; but the two pairs of discs at the posterior end of the plates are closer together. It can easily be recognised from the male *L. koenikei* by this fringe, the male *L. koenikei* being without it.

LOCALITIES.—Found by Mr. Scourfield in the Lake District, July, 1898. It is not a common mite.

(*To be continued.*)

THE NEW F.R.S.—The following candidates selected by the Council of the Royal Society for this year will be elected in the ordinary course. W. F. Barrett, physicist; Charles Booth, eminent in social science; David Bruce, bacteriologist Henry John Horstman Fenton, chemist; James Sykes Gamble, Indian foresty; Alfred Cort Haddon, zoologist and anthropologist; Henry Head, anatomist; Conevy Lloyd Morgan, biologist and geologist; Clement Reid, geologist; Henry Selby Hele Shaw, engineer; Ernest Henry Starling, physiologist; Henry W. Lloyd Tanner, mathametician and astronomer; Richard Threlfall, physicist; Alfred E. Tutton, mineralogist; Bertram C. A. Windle, anatomist.

With a few prominent exceptions, well known for their eminent scientific work, most of these gentlemen will be better recognised in their respective spheres than by our general readers.

ANNELIDS NEAR BIRMINGHAM.

AT a meeting of the Biological Section of the Birmingham Natural History and Philosophical Society, held on May 9th, Mr. Hildric Friend made a communication on the Annelids of Sutton Park. Mr. Friend stated that the Annelids with which he was to deal fell under two main heads. First, there were the earthworms or Lumbricidae. There were supposed to be eight or ten species in Great Britain, when Darwin's book on "Vegetable Mould and Earthworms" was published, but Mr. Friend had raised the number to twenty-four species, one-third of which he had already found in Sutton Park. There were there: *Lumbricus herculeus*, *L. rubellus*, *L. castaneus*; *Allolobophora profuga*, *A. caliginosa*, *A. chlorolica* and *A. sabrubicunda*, with *Allunus tetraedrus*.

The second group included the water-worms and white worms or Euchytracids. Omitting the Naids, some of which had been studied by Mr. Bolton, these small worms belonged to three families, the Tubificidae, Lumbriculidae, and Euchytracidae. *Tubifec vivulorum* was common; also *Limnodrilus wordsworthianus*, a worm at present known only in Great Britain and first described by Mr. Friend a year or two ago, from Cumberland. *Lumbriculius variegatus* undoubtedly occurs, as *Stylodrilus vejdovskii*, and what appears to be an undescribed species of *Stylodrilus*, which may prove to be new to science. *Nesembytraeus* is represented by at least one species, probably *N. flavus*. *Henlea* and *Buchholzia* also by one each at least, while *Euchytraeus parvulus* is of special interest because it has been lately proved to be a very injurious pest. *Fridencia*, a genus known among other things by its setae being shortest in the middle is represented by two or three well marked species. *F. agricola* has recently been suspected of doing damage to grass, and *F. magna* one of the largest known Euchytracids is new to science. It was found at Easter by Mr. Friend in Cumberland and at Sutton Park, and will be described at an early date. It is chiefly remarkable (1) for its size, being often more than an inch in length, (2) its setae in four pairs as in the typical Lumbrici, and (3) its spermathecae with large glands at the opening.

Mr. Friend stated that he had examined twenty species of worms, and as this was the result of two brief visits to the Park, the number would doubtless be greatly augmented by further exploration.

H. H. BLOOMER, Hon. Sec.

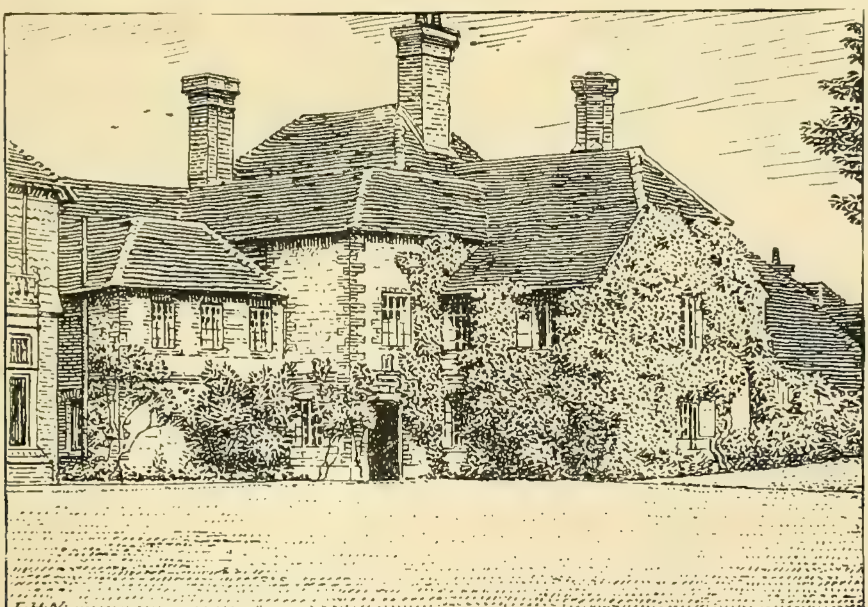
HEALTH RESORTS OF BRITAIN.—In an address before the British Balneological and Climatological Society, on April 27th, Sir Hermann Weber, M.D., gave an exhaustive analysis of the climate of the health resorts of Britain, compared with those of the Continent. His opinion is that our summer resorts are more desirable than those of the Continent, but the reverse is the case in winter.

BOOKS TO READ

NOTICES BY JOHN T. CARRINGTON.

The Natural History of Selborne. By GILBERT WHITE. Edited by GRANT ALLEN, with numerous illustrations by EDMUND H. NEW. 10 in. × $7\frac{1}{4}$ in. (London and New York: John Lane, 1899.) 1s. 6d., per part of 48 pp., net.

This issue of Gilbert White's classic, of the many that have been published, most nearly approaches an *edition de luxe.* The publisher has spared no pains or expense in producing a charmingly quaint old-style book, quite in accordance with the period when Gilbert White wrote his well-known letters and diary. It is satisfactory to find, unlike some other editions, the editor has not in his notes overshadowed the original author. In fact, it is not improbable that a little more evidence of the critical faculty, and a sharper comparison between White's old style natural history and modern knowledge, would have been an advantage to the present readers. We have before us a work to be coveted by every true lover of elegance in books. Mr. New's illustrations are excellent imitations of the woodcuts of last century, such as those with which Bewick delighted our grandfathers. Each letter commences with a picture of some bird, or charming bit of scenery from the Selborne district. The former are usually artistically treated, though most may be identified by the least informed ornithologist. Of the latter, by permission of Mr. Lane, we give on this page an example in a sketch of "The Wakes," the house in which White so long resided and wrote so much. We can cordially recommend this latest edition of White's Selborne to our readers.



The Wakes

From The Natural History of Selborne. Edited by Grant Allen.

The Flora of Cheshire. By the late LORD DE TABLEY. Edited by SPENCER MOORE, with Biographical Notice of the Author by SIR MOUNTSTUART GRANT DUFF. lxiv. + 399 pp. 8 in. × $5\frac{1}{2}$ in., with portrait of author and map of Cheshire. (London, New York and Bombay: Longmans, Green and Co., 1899.) 10s. 6d. net.

The author of this Flora was better known to botanists as John Byrne Leicester Warren, than by his title of Lord De Tabley, which he was the third and last to bear. After the author's death in 1895 his sister, Lady Leighton, while going through her late brother's papers, collected all the materials she could find relating to the Cheshire Flora and placed them in the hands of Mr. Spencer Moore, for arrangement. Thus it is we have the work before us, which forms an important contribution to the already numerous county and other Floras of Britain. With regard to arrangement and nomenclature, the former, with few exceptions, follows the seventh edition of the London Catalogue; as generally does the nomenclature; but the classification of the vascular cryptogams and Characeae is arranged in accordance with more modern ideas. Following the scientific names are the English, that have been selected strictly in view of adopting the binominal system, in which it is attempted, as far as possible, to give a free translation of the Latin equivalent. For instance, *Alchemilla vulgaris* is called lady's-mantle alchemil. The result is that we have rather a straining for uniformity to obtain binomalism, the hyphen doing considerable duty in the effort; as, for example, in red water-mint and large-flowered hemp-nettle. Occasionally

the system breaks down, unless by oversight in proof reading; for instance *Carex teretiuscula*, is called lesser panicled carex, in which we have clearly an example of trinomalism. There are many little incidents in the biographical notice of Lord De Tabley to amuse and interest, especially those who personally knew or corresponded with Mr. Warren. After an enumeration of the comital districts, which consist of the seven hundreds of the county, there follows details of their physical aspect, and of the characteristic plants, present or absent. A chapter is devoted to a list of persons concerned in the past with Cheshire botany, and particulars of their writings on the subject. There is also a list of books, periodicals, and manuscripts referred to or consulted, which in itself forms a useful bibliography for the county botanist. The book has been well produced by the publishers, the portrait of the author being quite a work of art.

Proceedings of the South London Entomological and Natural History Society. 1898. Part ii. 131 pp. 8¼in. × 5½in. and 3 illustrations. (London: The Society, 1899). 2s.

The scientific side of these proceedings contains several items of more than passing interest. There are papers on "The Scientific Aspects of Entomology," by Mr. J. W. Tutt, F.E.S., and "Lazy Days by the Sea," by Mr. R. Adkin, F.E.S., dealing chiefly with lepidoptera at Eastbourne, though other branches of natural history are touched upon. The presidential address by Mr. Tutt forms good reading, and affords much food for thought upon the pursuit of Natural History as followed in these days. Very different is its possibilities from the study in the "Collection" period of the middle of this century. In fact, it is a pity this address cannot be more widely read, than through the pages of these "Proceedings." The president's analysis of the financial value of each member on page 82, is an object lesson to local scientific societies, and puts the whole question of the practical side of such membership in a light that will be a revelation to many who consider themselves doing a society a favour by becoming members.

Lepidoptera of the British Islands. By CHARLES G. BARRETT, F.E.S. Vol. v. Heterocera, Noctuae, 381 pp., 9in. × 6in. (London: Lovell, Reeve and Co., Limited, 1899.) 12s. net.

This volume of Mr. Barrett's British Lepidoptera comencing with the genus Celoena, brings us to the end of the genus Xanthia. It is prepared with the usual care shown by its author in former sections. Mr. Barrett adds in this volume to the present difficulty of entomologists studying the Lepidoptera, by deviating from any other system of arrangement, though to a lesser extent than we have latterly had placed before us. It will be remembered that this work is also issued with coloured plates, the cost being three guineas per volume.

Buds and Stipules. By the Right Hon. Sir JOHN LUBBOCK, Bart., M.P., F.R.S., D.C.L., LL.D. vi. and 239 pp., 7½in. × 5in., illustrated by four coloured plates and 340 figures. (London: Kegan Paul and Co., Limited, 1899.) 5s.

This work, which forms one of the International Scientific Series, is devoted to a section of botanical study which becomes the more fascinating as we better understand it. The book before us by Sir John Lubbock renders its approach easy. Without attempting the dry science of botany, the possessor of this work may go forth to find lifelong interest in the formation and development of the leaf clothing of most of our trees and plants.

Stars and Telescopes. By DAVID P. TODD, M.A., Ph.D. xvi. + 419 pp., 8in. × 5½in., with 219 illustrations. (Boston, U.S.A.: Little, Brown and Co., 1899.) $2·00.

We have already noticed Professor Todd's "New Astronomy," and this is a companion handbook of popular astronomy. It is founded on Lynn's Celestial Motions. With this work, and the other by the same author, there is no difficulty in obtaining a sufficient knowledge of the subject for all ordinary purposes, as Professor Todd has a pleasant style of writing, which leads on his readers, in spite of themselves. The book is well illustrated.

Thornton-Pickard Album of Prize Pictures. 48 pp., 10¼in. × 7¼in., illustrated. (London: Dawbarn and Ward, Ltd., 1899.) 6d.

This may be described as an artistic scrap-book made up of prize specimens of photography sent to the Thornton-Pickard Co., of Altrincham, by competitors for their annual £200 prize competition, for prints taken by the "Amber" and "Ruby" Cameras, made by that firm. The prints have been well reproduced, and make an interesting album, as they number examples from many parts of the world. They are generally artistic and beautifully reproduced. There are several natural-history subjects among them.

Milk, Its Nature and Composition. By C. M. AIKMAN, M.A., D.Sc., 2nd edition, xx. + 180 pp., 7¾in. × 5in., illustrated with 21 figs. (London: A and C. Black, 1899.) 3s. 6d.

The object of this book is of the highest importance, as it investigates the association of milk with the fatal form of consumption technically known as tuberculosis. It is to be hoped that a greater general knowledge of the danger of consumption germs in milk, will draw public attention to the necessity of not using any but that which has been sterilised. In fact, the desirability of prohibiting the sale of any other is apparent. Dr. Aikman has given considerable consideration to this subject, as it naturally forms part of his work as Analyst at Glasgow. He divides his book into eleven chapters, commencing with the structure of the cow's milk-producing glands, and its secretion, gradually leading the reader through a history of this important article of food, in all its stages.

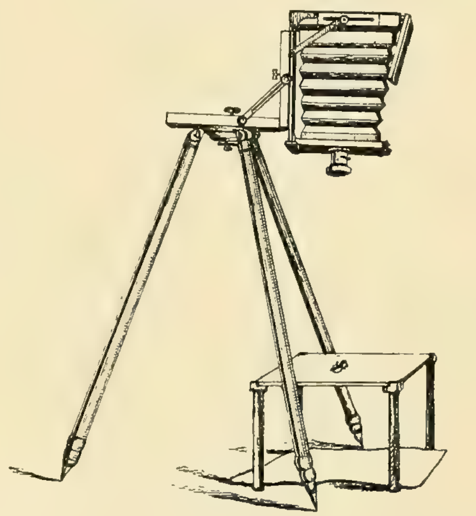
Volcanoes: Their Structure and Significance. By T. G. BONNEY, D.Sc., LL.D., F.R.S. iv. + 351 pp. 8½in. × 6in. 12 plates and 2 illustrations in text. (London: John Murray; New York: G. P. Putnam's Sons. 1899.) 6s.

Professor Bonney's new work is written for the ordinary reader who may be scientifically inclined, and this motive is kept in view so far as it is possible in a work of this kind. More or less a compilation, it is yet one that could not have been undertaken by anyone but an expert on past and present igneous phenomena, and rocks. To those for whom the work is intended, the chapters on "The Life History of Volcanoes," and "The Theories of Volcanoes," will prove extremely interesting. The part played by water and steam in creating explosions in the neck and in the crater, is well worked out. The general proximity of present-day volcanoes to the sea-coast is dwelt upon, as giving some explanation of the source of the steam. The question of the cause of the molten condition of the deep-seated materials of the earth also receives attention. There is a useful glossary of scientific terms used, and an index; also a folding-map showing the distribution of volcanoes, past and present.—E. A. M.

Notes & Queries

Singing-Flies.—The following note, extracted from my natural history diary and bearing on the singing or humming of Syrphidae while at rest will perhaps prove of interest to Mr. Edward H. Robertson (S. G., Vol. v. N.S., p. 345) and other readers of Science-Gossip. November 14th, 1896.—In August I had Butler's "Household Insects," for the first time. In it I found recorded, on the strength of the observations of some other observer or naturalist, the fact of a large species of *Syrphus* indulging in a humming or singing when seated on the ground on stones whilst at rest. This record at once recalled to my memory the fact that I had at least twelve months previously been surprised to hear a uniform shrill, high-pitched humming or singing close to my ear, whilst I was seated on a rail beneath the trees at the bridge crossing the burn in the Crofts at Killingworth. It was altogether different in tone from the humming of the numerous Syrphi or "hoverer-flies," which were soaring and darting about in the bright and warm sunshine of the afternoon. I thought the sound must emanate from some of them. Still, the uniformly equal tone, shrill and somewhat gnat-like humming or singing, appeared to be quite close to my ear, but on turning my head very gently, I could find no *Syrphus*, or other insect, hovering there, whence the sound appeared to proceed. I then gently raised the hat from my head, and as gently and slowly lowered it to the level of my eyes, when the musician stood, or rather sat, revealed on the brim of the hat. It was a black-and-yellow *Syrphus* of the same size as *Syrphus ribesii*, and was very probably that insect. Its wings, though closed, were not at rest, but were rapidly vibrating; so rapidly, indeed, as to give to them a hazy appearance. I perfectly satisfied myself that the peculiar humming proceeded from the seated *Syrphus*, and that the closed wings were rapidly vibrating. I could not have been quite certain of the species before the insect took flight, since I can find in my diary of August no note of the circumstance, and had, no doubt, hoped to repeat the experience, and identify the species before noting.—*Charles Robson, Killingworth, Newcastle-on-Tyne.*

Photographing Large Insects by Artificial Light.—On the top of a tripod or camera stand may be fixed a double board, hinged so that it will turn up at right angles with its base as in the accompanying sketch, and supported by a side rod or slotted bar. It will be seen that if the camera is screwed to the upright board, the lens will point downwards to the ground. It is obvious that if anything is placed on the floor, by using the camera in this position the object can be very readily seen on the ground glass of the instrument. Books, manuscripts and such like things that are difficult to fix up, can thus be very easily copied, and with a great saving of time. The size does not matter. One has only to lengthen or reduce the distance between the object and the lens to get the necessary reduction; but it is not for this purpose that I now describe an arrangement I have successfully used for some years in photographing insects, such as butterflies, beetles, or shells, leaves, single flowers, etc. Much time can be saved, as one has only to place the object on some suitable support, and photograph. Some people may inquire about the shadow, as it often mars the beauty of the photograph, though sometimes it adds very materially to its relief. To obviate this, I place my object on a sheet of clear glass with a piece of white or coloured paper, as the subject may require, at such a distance as to cast no visible shadow. That is to say, the shadow is lost before it reaches the paper. By this means one gets a negative of the object only. Some subjects look better on a clear ground, then use a sheet of white paper. For tinted ground, a grey; and for a black ground, a dull chocolate paper will be found the best, as it seems to have the least reflection and absorbs the light better than black. Such butterflies as the common- and marble-whites, small blues, etc., look better on a dark ground, whereas nearly all the others show better on a clear ground. The same remarks will apply to other insects. In making a series of photographs of butterflies, they should all bear the same relative proportion to one another, as in nature, and not be the same size. To obtain this, they should be taken with the



The "Freshwater Camera" for Insects.

same extension of the camera, and the same distance between the object and the lens. By working on these lines, one can obtain a set of photographs that are perfectly accurate in size, with relation to one another. I have not said anything about the method of exposure. This is the crux. If one's subject is not properly lighted and exposed we do not get a negative worth printing. I would at once say that if one has the opportunity, there is nothing like daylight; but it is not every one who can spare the time to work in the light of day. Further, many days during the winter months are not fit for such work, so it is best to use magnesium ribbon, as its photographic value is nearer to daylight than anything else. With seven inches of the ribbon, and a rapid, thickly-coated plate, one will find it easy to get a good negative, full of detail, and gradation of light and shade. The best developer to use is pyro-soda. For the formulae, see any of the photographic textbooks. I need scarcely remark that any printing paper may be used, preferably those of the gelatino-chloride type, as they give a brighter image.—*T. E. Freshwater, F.R.M.S., 3, Fleet Street, London, E.C.*

GEOLOGY

CONDUCTED BY EDWARD A. MARTIN, F.G.S.

DRIFT NOMENCLATURE.—It gave me much pleasure to see the amount of space devoted to this subject in your issue for April (p. 348). I hope its perusal will awaken an interest in a rather neglected section of geological science on the part of local observers in those districts where Drift deposits occur. It will lead, I trust, to further elucidation of a complicated and obscure set of deposits. I gather from Mr. Kennard's remarks that he regards the whole of the gravels near Dartford as practically contemporaneous. After comparing them with a very large number of similar deposits in Southern England, and for reasons given in my paper referred to by him, I think that those on Dartford Heath itself are older than those at lower elevations at Milton Street and Galley Hill. After carefully reading Mr. Kennard's remarks, I see no reason to alter my opinion. Unless considerable earth movements have taken place during the excavation of the Thames Valley, the higher gravels in a given locality, such as the one under consideration, would be the older. I was much struck during a study of the gravels of Southern England and the literature relating to them with the fact that all the Pleistocene Mammalia came from the set of gravels most closely connected with the present river system. Many gravel sections occur at higher levels, but have yielded none. An universal negative is, of course, easily refuted by one adverse fact. It is therefore of importance to see if the statement stands the test of future observation, as if true an important datum line is obtained. It was in consequence of this, that I could not allow Mr. Kennard's original remarks to remain unchallenged. The gravels occurring at higher levels in the same localities, than those yielding Pleistocene Mammalia have, as far as I know, only yielded the following evidence as to age. (1.) The Early Drifts near Lenham and above Westenhanger contain blocks of ironstone which yield casts of fossils referred by competent authorities to a Lower Pliocene fauna. The deposits containing them are therefore of later date. Similar drifts occur in many places in the South of England, but have up to the present yielded no fossils. Lithological evidence and a careful comparison of levels are our only data. (2.) At Dewlish, Dorsetshire, a distinctly Upper Pliocene fossil, *Elephas meridionalis*, has been found in a drift, in a deposit, situated at a lower level than the High Level or Early Drift of that district, and above the river terraces. It is thus seen that, although the evidence is admittedly slender, it distinctly points to the possibility, if not indeed the probability, of the intermediate series of drifts, termed Lower Plateau Drifts, being of Pliocene age. Here the local observer might unearth valuable evidence. Mr. Kennard finds fault with the names used by me to designate the broad divisions of these drift deposits, but I have merely adapted those previously used by the Geological Survey, and some of the authorities he quotes. The term "Early Drift" is defined by me in a previous paper, "Pebbly Gravel from Goring Gap to the Norfolk Coast" (Proc. Geo. Assoc, Vol. xiv., pp. 389 to 404), and the term "Glacial" is also there explained. It would be an easy task to show that the terms suggested by him are far from being above reproach, but it would take far too much of your valuable space. The fact is, that a great deal of work must be done before we can definitely, and with some approach to mathematical precision, correctly classify and name these obscure deposits. In conclusion, I may state that the object I had in view in writing the paper referred to, was to describe the gravels at greater heights O.D. than those on the river terraces, and these latter are taken only as a kind of base line.—*A. E. Salter*, 14, *Amersham Road*, *New Cross*, *S.E.*, *April*, 1899.

WORK OF THE OUSE.—Under the above heading, in the "Annual Report of the Yorkshire Philosophical Society" for 1898, issued a few days ago, Mr. H. M. Platnauer, B.Sc., gives the results of some observations he has been making with regard to the amount of material brought past York, by the waters of the Ouse. As these have some bearing upon a note on the "Origin of the Humber Mud," published in SCIENCE-GOSSIP, Vol. v. p. 7, a summary of Mr. Platnauer's observations may not be out of place. The method of procedure was very simple: 102 different samples were taken from the River Ouse, and a litre of each evaporated to complete dryness. The residue thus obtained was carefully weighed. An estimate of the quantity of water passing a given point in a given time was then obtained, and a short calculation gave the amount of solid matter passing York in any given period. Mr. Platnauer estimates that, taking everything into consideration, about 300,000 tons of material are annually carried past the City of York, in the waters of the Ouse. Unfortunately, no attempt has been made to differentiate between the amount of solid matter in solution and that in suspension; though, we are promised, experiments on these lines will be shortly conducted. What at first seems remarkable, however, is, that when the water is swollen with flood, and, consequently, turbid, there is less solid matter per litre after evaporation than when the water is clear, and flowing under ordinary conditions. This is no doubt accounted for by Mr. Platnauer, who rightly states that in the former instance the water is principally surface water, whilst in the latter it has passed through the soil and rock, and reached the Ouse by means of springs. It is then consequently charged with much mineral matter. If, therefore, during a "fresh," when the water is full of numerous fine particles in suspension, there is less solid matter per litre than when the stream is normal and clear, it is evident only a small proportion of the 300,000 tons annually swept past York is in suspension. Of course it is not forgotten that when the river is in flood a far greater quantity of water, and consequently solid matter, passes York in a day than when the water is low. But the period of flood is not a long one. It is also very probable a large proportion of this matter in suspension never reaches the Humber, but it is deposited on the alluvial flats, as shown in the article in SCIENCE-GOSSIP for June, 1898, already referred to. Now, with regard to the bearing of Mr. Platnauer's notes on the origin of the Humber mud, his observations conclusively show that, comparatively speaking, there is no extraordinary amount of suspended material brought past York, and probably a much less volume gets into the estuary. I say "comparatively speaking" advisedly, as only those who are acquainted with the vast accumulations of muds and silt, usually of

enormous thickness, stretching along for miles and miles on the sides of the Humber, can appreciate their magnitude, and speak as to the inadequacy of the three rivers flowing into the estuary to lay down such extensive deposits. It would be interesting if similar experiments to those made at York could be conducted nearer Goole, though allowance would have to be made for material brought in by the rise of the tide. Of course Mr. Platnauer's note was not written for the purpose of showing what amount of material eventually reached the Humber in the form of sand and mud. He simply demonstrates in a very lucid manner what geological work is actually being performed by the river Ouse. If similar observations could be systematically undertaken on our other rivers, some very valuable results might be obtained. We anxiously await the appearance of Mr. Platnauer's further notes. —*Thomas Sheppard, 78, Sherburn Street, Hull; 15th April.*

BRIGHTON CLIFF FORMATION.—Referring to Mr. E. A. Martin's note on the fine section of the chalk breccia or Coombe Rock displayed in the cliffs to the east of Brighton (S.G., Vol. v., N.S., p. 376), it may interest the readers of SCIENCE GOSSIP to know that to the west of the town there is a good exposure of the bed of sand, which, owing to the inroads of the sea, has, as Mr. Martin remarks, since disappeared from the eastern side, where it occupied a position midway between the Chalk and the raised beach. This occurs in a small quarry on the sea front at Portslade, where is seen the Coombe Rock, much reduced in thickness, resting on a bed of marine sand, exposed to a depth of six feet. At the eastern part of the cutting there are a few rolled flints in the top part of the sand. They are the sole representatives of the mass of shingle under and on the other side of Brighton. I have obtained specimens of *Mytilus edulis* from the ancient beach. This mollusc, together with *Littorina obtusata*, is very abundant in the sand, and pebbles encrusted with a species of *Balanus* are not uncommon. Both have yielded remains of a whale, *Balaena mysticeta*. Many mammalian bones, including teeth of *Elephas primigenius* and *Rhinoceros antiquitatis*, have been exhumed from the Coombe Rock. Specimens of all these, together with a Palæolithic flint implement from the base of the last-mentioned formation at Portslade, can be seen in the Brighton museum. The Coombe Rock covers up all the marine drift of the Hampshire Basin, where it can be traced to the dry chalk valleys of the South Downs and their westerly extension, from each of which it projects on to the lower ground in the form of a large semi-circular talus. The origin of this curious deposit is not fully known, but it seems to have been formed during a period when extreme cold was the predominant feature. It is not difficult to imagine that severe frosts had strewn the chalk slopes with a deep layer of rubble. In the winter, wind storms would seal this up under a cover of snow, which would be congealed into a névé. Under the influence of the summer heat, this minor ice-sheet would partially melt, and great masses would slide down the hillsides, dragging with them the loose débris, and the boulders of sandstone which were already scattered over the downs. On the final disintegration of the ice and snow, piled up by this process in the bottom of the valley, great floods resulted, which swept much of the detritus far out into the plain below. Mr. C. Reid speaks of the mass covering Selsey Bill, as being coarse and gravelly to the north, and loamy to the south. This is just what one might expect, for the process of sifting the larger from the finer material, and the carriage of the latter further afield, would be going on long after the torrential waters had spent their original energy.—*J. P. Johnson, c/o Stanley and Co., High Street, Sutton, Surrey.*

GLACIAL DRIFT OF WHEATHAMPSTEAD.—At Mill Hill some gravel has been laid down as road-material, which is full of fossils from the Chalk. There are a great many sponges in it, chiefly *Ventriculite* and *Cliona*, also *Micraster* and *Salenia*. Drift with derived rocks and fossils, such as *Gryphaea dilatata* and Belemnites from the Oxford Clay has also been utilised, together with masses of freestone with *Rhynchonella angulata* from the Inferior Solite. On asking a man one day where these gravels came from, he said they were brought from Wheathampstead. I went down and visited the beds. There was plenty of drift, but the sponges were not so abundant. Why should the sponges be so abundant in the gravel, whereas in the south east of London the echinoids are the most plentiful?—*G. Fletcher Brown, 3, Topsfield Parade, Crouch End, N.*

CORRELATION OF THE ECHINODERMATA.—In his paper before the Geological Society on "Fossils in the University Museum, Oxford: Silurian Echinoidea and Ophiuroidea," Professor W. J. Sollas called attention to the correlation of structure and function in the locomotive organs of Asterids, Ophiurids and Echinids. In the case of the two latter, movement depends on tension directed along the tube-feet. In Starfish this tension is met by the disposition of the ambulacral ossicles in the form of an arch; in Urchins by a continuous tesselation of the surface, which would only be weakened by arch-like interruptions. If, however, urchins have evolved from an Asterid stem, they may have originally possessed arch-like ambulacral grooves, and the present plates of the ambulacra may have been subsequently acquired. In *Palaeodiscus ferox* of the Lower Ludlow, Leintwardine, which by the structure of the buccal armature is definitely shown to have been an Echinid, the ambulacra possess just the characters as theory anticipates; an inner arch of poriferous ambulacral plates, homologous with those of a starfish, is closed externally by a series of paired plates, which represent the ambulacral series of an urchin.

GROWTH OF STALACTITES.—At a recent meeting of the Royal Society of New South Wales, Professor Liversidge exhibited some specimens of stalactites and stalagmites from the tunnel at the Prospect Reservoir, Sydney, which had been collected by Mr. E. Hufton. The tunnel was built some twelve years ago, and the comparatively large size of the stalagmitic deposit—nearly 2in. in thickness—gives an idea of the rate of deposition of calcium carbonate. The exhibitor believes they have been derived mainly from the cement of the tunnel, inasmuch as he understands that no limestone was used in its construction, nor is there any in or about the reservoir. The catchment area is essentially of sandstone, and the water consequently poor in lime.

GEOLOGY OF DAVOS.—At the meeting of May 10th, of the Geological Society, Mr. A. Vaughan Jennings, F.L.S., F.G.S., read a paper on the physical structure of the Davos Valley, which is rather oblique to that of the great rock masses, but is, however, somewhat irregular. These which have a general dip towards the south and east, form three great acute and rudely parallel overfolds; the westernmost being the more complicated, and is partly serpentine, with certain crysalline Breccias, in the vicinity.

CONDUCTED BY F. C. DENNETT.

	1899 June	Rises h.m.	Sets h.m.	Position at Noon R.A. h.m.	Dec. ° '
Sun	6	3.47 a.m.	8.10 p.m.	4.57	22.40 N.
	16	3.44	8.17	5.39	23.22
	26	3.46	8.19	6.2	23.22

	June	Rises h.m.	Souths h.m.	Sets h.m.	Age at Noon d. h. m.
Moon	6	2.14 a.m.	10.25 a.m.	6.47 p.m.	27 18 21
	16	0.19 p.m.	6.10 p.m.	11.48 p.m.	8 5 40
	26	10.7	2.27 a.m.	7.20 a.m.	18 5 40

	June	Souths h.m.	Semi-Diameter	Position at Noon R.A. h.m.	Dec. ° '
Mercury	6	11.16 a.m.	2·6"	4.15	20.48 N.
	16	0.9 p.m.	2·5"	5.48	24.37
	26	1.2	2·7"	7.19	24.8
Venus	6	10.7 a.m.	5·7"	3.6	15.50 N.
	16	10.16	5·6"	3.55	19.2
	26	10.27	5·4"	4.45	21.25
Mars	16	4.32 p.m.	2·6"	10.11	12.32 N.
Jupiter	16	8.16	19·1"	13.55	10.27 S.
Saturn	16	11.37	8·5"	17.17	21.36 S.
Uranus	16	10.33	1·9"	16.13	21.5 S.
Neptune	16	11.59 a.m.	1·2"	5.36	22.5 N.

MOON'S PHASES.

		h.m.			h.m.
New	June 8	6.20 a.m.	*1st Qr.*	June 16	9.46 a.m.
Full	„ 23	2.20 p.m.	*3rd Qr.*	„ 30	4.45 a.m.

In apogee June 13th, at 3 a.m., distant 251,800 miles; and in perigee on 25th, at 5 a.m., distant 224,200 miles.

CONJUNCTIONS OF PLANETS WITH THE MOON.

June				° '
June 6	Venus+	2 a.m.	planet	5.10 S.
„ 7	Mercury*	1 p.m.	„	2.13 S.
„ 14	Mars*	10 a.m.	„	6.17 N.
„ 19	Jupiter*+	9	„	6.6 N.
„ 22	Saturn*	7 p.m.	„	2.22 N.

* Daylight. + Below English horizon.

OCCULTATIONS.

June	Star.	Magnitude.	Disappears h.m.	Angle from Vertex.	Reappears. h.m.	Angle from Vertex.
2	19 Piscium	5	2.53 a.m.	55	3.40 a.m.	317
25	*f* Sagittarii	5	1.17	32	2.12	283
28	κ Piscium	5	11.22 p.m.	70	12.10 p.m.	315

ECLIPSES OF THE SUN AND MOON.

In the early morning of June 8th there will be small partial eclipse of the sun. At Greenwich it begins, 6° west of the Vertex at 4.23 a.m., and ends 70° east of the Vertex, at 5.53 a.m., so that the greatest phase occurs at 5.17 a.m., when the magnitude of the eclipse will be 0·19, taking the sun's diameter as unity. Farther north the magnitude, and duration of the eclipse is slightly increased.

There will be total eclipse of the moon on the early afternoon June 28th, quite invisible in England, but in splendid position for our Australian brethren.

THE SUN should be watched for occasional outbreaks of activity on his surface. Summer is said to commence at 4 p.m. on the 21st June when the sun enters the sign Cancer.

MERCURY is in superior conjunction with the sun at 7 p.m. on 14th, afterwards becoming an evening star, which, at the end of the month, does not set until nearly an hour and a quarter after the sun. On 30th a line drawn through Castor and Pollux will point almost exactly to it. In conjunction with Neptune at 7 a.m. on 14th June.

VENUS is a morning star all the month, poorly placed for observation, except by day.

MARS has now become too small for useful observation, besides having to be looked for as soon as possible after sunset.

JUPITER is still well placed for observation. It is a very interesting object this season, from the broken state of the north equatorial belt.

SATURN being in opposition at 2 p.m. on 11th is at its best this month. On the 4th the major axis of the outer ring is 42.64", and the minor axis 19.12", whilst the diameter of the planet is only 17", so that the whole object is very beautiful, notwithstanding its low altitude.

URANUS is still as well placed for observation as its southern declination will permit.

NEPTUNE is in conjunction with the sun at 9 p.m. on 15th, and so cannot be observed.

METEORS may be looked for specially on 6th, 7th, 22nd, 29th, and 30th.

SWIFT'S COMET, 1899*a*, may be observed. Its path takes it through Draco, Hercules, and Boötes.

		R.A.		Dec.	Brightness
May 31	R.A.	18h. 22m.	Dec.	56°56' N.	Brightness 1·5
June 5	„	16 40	„	51·10	„ 1·2
„ 10	„	15 39	„	43·2	„ 0·8

NEW MINOR PLANET was discovered by M. Coggia of Marseilles, on 31st March. Over thirty-one years have elapsed, since his first similar discovery was made.

SATURN'S NINTH SATELLITE has had the name Phoebe, one of Saturn's sisters, proposed for its designation by its discoverer, Professor W. H. Pickering. Its diameter is probably not over 200 miles, and as seen from Saturn, does not probably exceed a 6th magnitude star.

"THE CAMBRIAN NATURAL OBSERVER."—The quarterly journal of the Astronomical Society of Wales has come to hand, and contains as a frontispiece a very fine drawing of Mars by Rev. Theodore E. R. Phillips, as well as 32 pp. of interesting matter. It may be obtained from Mr. A. Mee, 41, Hamilton Street, Cardiff.

ROTATION OF MARS.—The latest determination by Professor H. G. Van de Sande Bakhuyzen, from all available data, is 24h. 27m. 22·66s., the mean error + 0.0 132s. He finds that in Herschel and Schröter's time a very dark spot similar in form to the Kaiser Sea, existed 50° or 55°. preceding that object, north of the Maraldi Sea.

JUPITER IN 1899.—Reference is made above to the broken state of the north equatorial belt of this planet, which may in part be seen with even a three-inch telescope. It is beautifully shown in the two splendid drawings kindly sent by the Rev. Theodore E. R. Phillips of Hendford Vicarage, Yeovil, as seen with his 9¼in. with reflector. Mr. Phillips says: "The dark north tropical spot in the first drawing is a very rapidly moving spot," having a mean rotation period of 9h. 55m. 13·3s., and which seems to be now in more rapid motion than when first observed. He continues: "The red spot is still visible in good air, though very faint. To me it has lost all trace of red, and is now quite grey. The dark material immediately south of the red spot in the second drawing has apparently been drifting rather more quickly than is usual with objects in that latitude. You will see the shadow of Satellite II. just coming on the disc." For these drawings, see next page.

CHAPTERS FOR YOUNG ASTRONOMERS.

By Frank C. Dennett.

USE OF THE TELESCOPE.

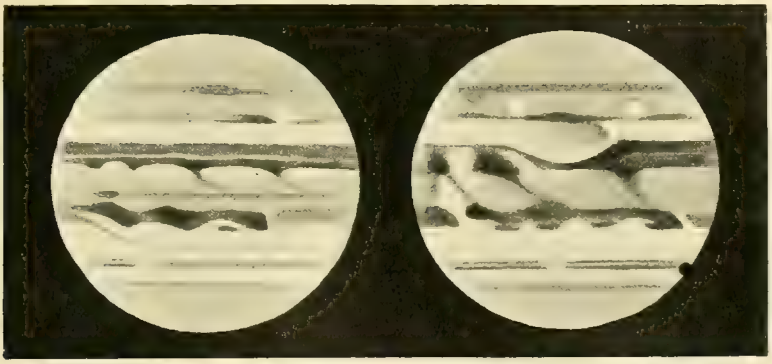
(Continued from Vol V. p. 375.)

One of the first things to be ascertained on purchasing a telescope, is the exact magnifying power of each of its eyepieces. To do this accurately, focus the instrument upon some celestial object, then direct it, during daytime, at the bright sky, as low down as is practicable. If a lens of, say, 2in. focus be applied to the eye, and the light coming from the eyepiece examined, a little image of the object-glass will be found, when the eye and lens are drawn back a certain distance from the eyepiece. Let this tiny image be carefully measured. Personally, I usually effect this with the thin glass ruled to $\frac{1}{100}$ths of an inch, which I use as an eyepiece micrometer with a microscope. We will suppose that the tiny disc of light has a diameter of $\frac{1}{16}$th of an inch. If the object-glass has a clear aperture of $2\frac{1}{4}$in. the magnifying power with that eyepiece would be 36. If the aperture of the object-glass is 3in., then the power would be 48.

length. This should be dead blacked inside, either with paint, or with black velvet glued in. It should fit on firmly, in place of the cap over the object glass. This lessens the chance of "dewing"; or condensation of atmospheric moisture on the object glass.

Be careful to have the instrument well focussed. Different objects need re-adjustment according to their brightness, and after close work for a little time, the eye needs a slight alteration, even when looking at the same object. For examining planetary detail a still night with a slight frosty fog is often the best. The most brilliant nights are not always the best for fine definition, but are available for looking at star clusters and nebulae. In looking for nebulae, star clusters, or comets, the lowest powers with the largest field of view are required, some only being visible with such powers. The Kellner eyepiece is specially constructed for this work. Some star clusters and nebulae, however, will bear fairly high powers. The best power for planetary work is usually about 50 to the inch. Thus a power of 150 should be used with a 3-inch objective. For double stars. a higher power. from 60 to 100 to the inch, *i.e.*, 180 to 300 on a 3-inch, may sometimes be employed. Some stars however are most clearly

Scuth. South.



April 15th—12h. 10m. G.M.T. May 6th—10h. 20m. G.M.T.

The Planet Jupiter in 1899.

Drawn by the Rev. Theodore E. R. Phillips.

(See page 20.)

After the magnifying powers of the eyepieces have been ascertained, next find the angular diameter of that portion of the sky visible with each eyepiece, when it is truly focussed. This section of sky is known as the "field of view." To do this, turn the telescope on some star near the celestial equator, such as δ Orionis, or η Virginis, and accurately measure the interval of time elapsing during the passage of the star across the centre of the field of view from East to West, then turn time into angular diameter. For instance, if the object takes just two minutes of time to cross the field of view, the angular diameter of that field of view is 30′ or half a degree. Minutes or seconds of time multiplied by 15 give minutes or seconds of arc.

If possible always use the telescope out of doors, not from a room through a window. If the latter method is sometimes unavoidable, let the end of the telescope be well out of window to avoid the heated air passing from the room. The floor too, is susceptible of every movement, which is communicated to and magnified by the instrument. Never try to look at an object over, or to leeward of a chimney in use, nor, if possible, close to the horizon. It is always best to use a "dew cap," a piece of light tubing about three diameters of the object glass in

seen with low powers. Practice is the best guide in these matters. Faint comparisons near to brilliant stars are often best seen in strong twilight, or with a full moon, this masks the glare of the large star.

In looking at the sun it is safest to employ a solar reflector, which is a surface of glass reflecting only a portion of the light through the eyepiece and sunshade. This prevents the dark sun-glasses from getting cracked, and sometimes the observer's eye from being destroyed.

When making observations, always take instant note of what is seen; for, if an interval is permitted, the memory becomes clouded by uncertainties. Carefully note the date and time of every observation. It is always well, if possible, to supplement written notes by diagrams or drawings. To do this it is not necessary to have studied drawing. A diagram of, say, Jupiter, would show the position of any markings far better than any amount of written description. With practice comes proficiency. In drawing a planet, or a portion of the moon's surface at the telescope, do not attempt to finish as proceeding. First get rough outlines done, fill in the positions of the spots or shadows, note the time, and then proceed to fill in the finer detail. No one knows the value of even a rough diagram.

(To be continued.)

PHYSICS

CONDUCTED BY JAMES QUICK.

THE ELECTRIC ARC.—The investigations conducted by Mrs. Ayrton, and her paper read before the Institution of Electrical Engineers on March 23rd last, have considerably extended our knowledge of the conditions governing the electric arc. Everyone is familiar with the hissing that takes place with an arc lamp, when the current or other conditions are altered. Detailed work, however, upon the manner in which this hissing is brought about has not hitherto been done. Among other things, Mrs. Ayrton has found that when the length of the arc is constant and the arc is silent, it may be made to hiss by increasing the current; also when the current is constant and the arc is silent, shortening the arc will make it hiss. If the arc is a silent one, it is found that the difference of potential varies as the current, and that this variation is different with solid and with cored carbons. On the other hand, with a hissing arc the difference of potential is the same for a given length of arc and a given pair of carbons whatever current is flowing. This law also is true whether the carbons be cored or solid. There thus seems to be a sudden breakdown when hissing occurs. Furthermore, it is found that the longer the arc, the less does the difference of potential between the carbons diminish, when the arc changes from silence to hissing. Next, considering the appearance of the crater under various conditions, quite a distinct difference takes place when a current is reached of a certain magnitude, depending only on the length of the arc with a given pair of carbons. The crater becomes partly covered with what are apparently bright and dark bands in concentric circles. The directions of rotations change continually, and the motion grows faster as the current increases. When due to the latter cause, the motion becomes too fast to be followed by the eye, the arc begins to hum. Mr. A. P. Trotter in 1894 made measurements upon the velocity of rotation in these circumstances, and found it to vary from 50 to 450 revolutions per second. At about this highest speed the arc commences to hiss, and then the whole appearance of the crater again changes. Many more interesting results were brought forward by Mrs. Ayrton. The paper elicited a lengthy discussion.

PHOTOGRAPHIC ACTION WITHOUT LIGHT.—Some striking phenomena have recently been worked out by Dr. W. J. Russell upon the action exerted by certain metal and other bodies on a photographic plate in the dark. These "active" bodies have been divided into two groups—the metals magnesium, cadmium, zinc, and some five or six others forming one group, and the class of organic bodies known as the terpenes forming the other. When any of these bodies are placed either in contact or in close proximity to the film of a plate, they exert, under certain conditions, a more or less strong photographic action upon it, and an image is produced by the ordinary methods of developing. These results should certainly be welcome, especially to photographers, as probably they will explain many a hitherto inexplicable fogging on an unexposed plate. Dr. Russell's experiments go at present to prove that hydrogen peroxide is the active agent in these phenomena.

SCIENCE ABROAD

CONTRIBUTED BY FLORA WINSTONE.

LA NATURE (Paris), April 29th, contains an article by M. J. Poisson on the Echinocactus of Lower California. The directors of the "Jardin des Plantes" of Paris have placed for a stated time a certain amount of room at the disposal of travellers, that they may have opportunity for showing any objects of interest obtained from foreign countries. This novel exhibition was opened in February last, and contains some interesting specimens in zoology, ethnography, chiefly of the Indian races, and botany. The notes by M. Poisson relate more particularly to the flora of Lower California, especially the Family Echinocactus. Two fine illustrations are given, one in which are a number of young plants, and another, giving a fine specimen of *E. digueti* Webb. Its height is more than twice that of a medium-sized man. Its trunk, however, never hardens into wood, and it can always be pierced with ease. The flesh-like mass makes a very nice sweetmeat, which is sold under the name of "Sweet of Visnaga," that being the colloquial term for cactus. In the same number, M. Aclogue writes on the metamorphoses of insects, selecting as his example one of the Ephemeridae. A figure is given of the insect after emergence from chrysalis. Another new generator for acetylene gas is noticed by M. J. F. Gall. The apparatus is illustrated by three figures, but though new in some of the details, it does not appear to differ in general principles from those already in the market. (May 6th) M. Albert Vilcoq contributes an illustrated article on the gadfly. This family of the Diptera are especially interesting because, although they are inveterate enemies of farm animals, they are little understood by the farmers, and the means employed to destroy them are often ineffectual. The various divisions of the Family are described, as are also the organs which they respectively attack, and the symptoms that attend their presence. A few methods of treatment are suggested, but none of them appear to be of much use. There is a short note by Jacques Boyers on the Telegraph and Telephone in Persia.

COMPTES RENDUS (Paris), May 1st. This number contains a note by M. Armand Gautier on Iodine in sea-water. It is usually supposed that the sea contains a large proportion of iodines principally as ioduretted alkalis. The writer, however, in the course of various experiments demonstrates that the open sea does not contain, either on the surface or several metres below, any trace of iodide or ioduretted alkalis. M. Gautier says he cannot at present explain the presence of organic iodides in algae, sponges, and seaweed, but he proposes to carry on a series of experiments likely to elucidate the cause. M. Stanislas Meunier notifies the observation of the fall of a meteorite in Finland at the end of March. The circumstances were peculiarly favourable for observation. It was seen to travel along a considerable portion of the sky above the littoral of the Baltic Sea, falling at last not far from the town of Borgo. It will be presented to the collection of meteorites in the Museum of the Academy of Sciences, France.

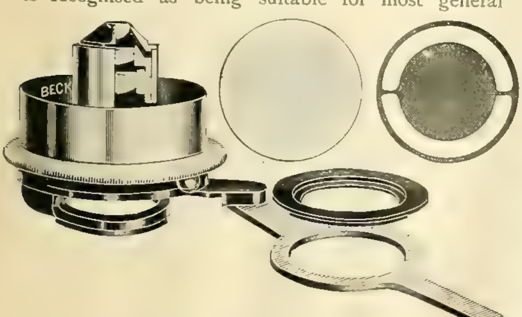
MICROSCOPY

CONDUCTED BY F. SHILLINGTON SCALES, F.R.M.S.

To Microscopists.—With this number Science-Gossip begins a fresh volume, and the microscopical column comes under new editorship. A few introductory words as to our aims may, therefore, not be out of place. Our object is to make this column as interesting and as helpful as possible to our readers, by keeping them informed of various matters of interest in the microscopical world, especially with reference to methods of work. We propose in future to lay greater stress, from time to time, upon the improvement of the microscope and its accessories. We desire, in fact, to make this column a valuable record of the progress of the microscope, of new or modified stands, objectives, apparatus, etc. The present keen competition amongst opticians, especially amongst the limited few who are in the front rank, and with whom workers are mostly concerned, gives rise to constant progress. It will be our endeavour to keep our readers advised on these points without fear and without favour. May we add that we shall especially welcome letters from our readers, who have, we think, scarcely realised how much help they may gain, or give, by taking advantage of the free hospitality of these columns. We shall ourselves be glad to answer through this medium any enquiries on miscropical matters that may be sent us if addressed to the office of Science-Gossip.

Cleaning Slides.—We can recommend the method mentioned by Mr. Cole for cleaning glass slips and covers, whether used or not, namely to immerse them bodily in a strong solution of Hudson's soap-powder in warm water. Soak for an hour or two, wash well with changes of warm water, and finally, if necessary, with methylated spirit. Cover glasses and slips for important work may require special methods.

New Achromatic Condenser.—Although the Abbé Condenser, or, as it is often called, Illuminator, is recognised as being suitable for most general



R. & J. Beck's New Condenser.

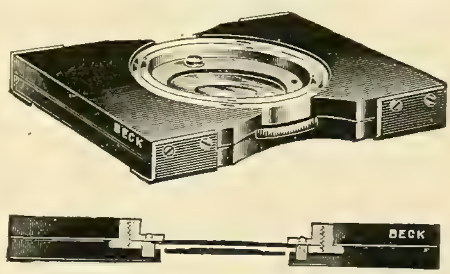
practical work, mainly on account of its being easy to use, yet for more critical work a well corrected condenser becomes a necessity. Messrs. Beck have brought out a new condenser for high-power work that is *achromatic* and has a numerical aperture of 1 N. A. This is the maximum that can be obtained without having the front of the condenser in immersion contact with the under surface of the slide, and its *aplanatic* aperture exceeds ·9 N.A. It is thus greatly superior to the ordinary Abbé Illuminator. The front lens is removable to make a low-power condenser. An Iris diaphragm and a swinging arm, with rotating fitting for coloured glasses, or stops, are provided. A bracket is ingeniously added at the bottom of the mount, into which the optical portion may be screwed, and the whole condenser thus reversed. This is often a convenience. The price of the complete condenser is £3, but with Iris diaphragm only £2 5s.

New Triple Nosepiece.—Messrs. Beck have also brought out a new triple nosepiece in bright lacquered brass, the price of which is only seventeen shillings

Beck's New Triple Nosepiece.

and sixpence. It is not perhaps quite so attractive as the ordinary trefoil-shaped pattern, but has the advantage of being dust-proof and cheap.

New Reversible Compressor.—A third novelty which the above firm have brought under our notice is a new reversible compressor, designed by Mr. H. R. Davis. Briefly, we may say that it is made of ebonite, and consists of a lower and two upper plates. The lower plate contains an oblong thin glass, held in position by two screws, the two upper plates contain



The Davis Reversible Compressor.

a projecting milled ring, which, when revolved, brings an upper thin glass in contact with the lower glass. The whole arrangement is easily taken apart and conveniently arranged, whilst it is eminently serviceable. The price is 10s. 6d.

Dissecting Microscopes.—Messrs. Bausch and Lomb have brought out two new dissecting microscopes. The one consists of a small wooden case or box, 4 inches × 2 inches × 1½ inches. One end of the case and the top is removable, and serves as a cover. A small glass stage slides in a groove at the top of the box, and can be replaced by a glass stage with cell, opal glass stage, or black glass stage. Beneath is a plane mirror, and an upright rod carries three lenses, magnifying from 5 to 25 diameters. The other dissecting microscope is very similar to Leitz' well-known stand, but the focussing is by sliding adjustment instead of by rack and pinion.

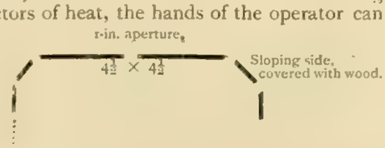
Abbé Camera Lucida.—Messrs. Bausch and Lomb have also brought out a simplified form of this camera, in which the mirror and prism are enclosed

in a mount and fixed, the mirror itself being reduced in size. The whole is attached to the microscope by a clamp, and can be swung aside as required; whilst it can further be adjusted in position so as to be used with various eye-pieces.

DECOLORISING ALGAE.—Dr. H. C. Sorby has found that diluted formalin decolorises algae, and by means of this reagent has succeeded in so reducing the colour as to show the natural colouring of such algae in lantern slides, instead of exhibiting only the ordinary dark shadows.

KILLING AND PRESERVING MARINE ANIMALS.—Dr. Sorby also finds that the addition of a small quantity of menthol to the sea-water in which marine animals are kept, causes them to expand fully. They can then be preserved permanently in a four per cent. formalin solution. By this method he has preserved *Synapta* and several species of sea anemones. He also suggests the use of dilute glycerine for killing some animals. Afterwards he removes this by water, and subsequently mounts in Canada Balsam. By this means he has been able to mount certain worms, so as to show the minute blood-vessels filled with the natural red blood. Both these methods were exhibited on May 3rd, at the Conversazione of the Royal Society. particulars as to height and width of microscope-stage.

NEW STAGE-TABLE.—The little table herein illustrated has been a veritable *multum in parvo* to me. It was first devised as a rough stage for the microscope. That instrument being placed vertically, the table is brought over its stage, and admits work of the roughest character without danger to the microscope. Further, it can be heated by aid of a spirit lamp, and when hot enough placed over the microscope, thus acting as a hot stage, extremely useful in watching crystallisation, etc. The wooden hand-rests being non-conductors of heat, the hands of the operator can



conveniently rest on them during manipulation, while the top plate is too hot to conveniently handle. Again, for utility in mounting purposes, it is far in advance of the orthodox four-legged brass table of our forefathers. Needless to say, this simple instrument lends itself to numerous purposes, known only to the working microscopist in his daily round. A sheet of brass $\frac{1}{8}$ inch thick, $4\frac{1}{2}$ inches wide, and 16 inches long, or of a size to suit the microscope, has an arc cut out of each end, leaving $\frac{1}{2}$ inch each side for legs when the table is finished. From the centre of the $4\frac{1}{2}$ inch by 16-inch cut a circular aperture 1 inch in diameter. At $3\frac{3}{4}$ inches, also at $5\frac{1}{4}$ inches, from each end, drill and counter-sink a $\frac{3}{16}$-inch hole, $\frac{3}{4}$-inch from each side; that is four holes at each end of the sheet of brass. Then bend the sheet into the form of part of an irregular octagon, as in the accompanying diagram, the 1 inch aperture being in the centre of the proposed table-top, which, when finished, should measure $4\frac{1}{2}$ inches by $4\frac{1}{2}$ inches, take care that the counter-sinks are on the underside. Then take two pieces of apple wood $\frac{1}{2}$ inch thick, the size of your sloping-table sides. Screw these to the sides, a piece of asbestos cloth intervening; neatly finish, and the day's work will never be regretted. Microscopists, not of the amateur mechanic fraternity, had better place the work in the hands of an optician, giving him the particulars as to height and width of microscope-

G. West, 128, *Kentish Town Road, London, N.W.*

IN MEMORIAM

JABEZ HOGG.—The sudden death is announced of Mr. Jabez Hogg, M.R.C.S., F.R.M.S., which took place in his 83rd year, at his residence, Palace Gardens Terrace, Kensington, on the 23rd of April. Mr. Hogg was born at Chatham, where his father held an appointment in the Royal Dockyard. He was educated at Rochester Grammar School. His first occupation was on the staff of the "Illustrated London News," which he joined in 1843, but in 1845 he entered the medical school at Charing Cross Hospital, and in 1850 became a member of the Royal College of Surgeons. Ophthalmic surgery received his chief attention, and in that branch of the art he practised in London, long living in Bedford Square. Microscopy, as a science, soon occupied his spare time, and he became a F.L.S. in 1866, and hon. secretary of the Royal Microscopical Society from the following year until 1872. Among numerous literary efforts, he is best known to microscopists by his many editions of "The Microscope: its History, Construction, and Applications," the 15th edition of which we recently noticed.

CHARLES LEESON PRINCE.—We have to record the death at The Observatory, Crowborough, Sussex, on 22nd of April, of Mr. Chas. L. Prince, M.R.C.S., F.R.A.S. Meteorology was Mr. Prince's chief occupation, and he had carried on careful observations, especially on temperature, for many years past. The Royal Astronomical and the Meteorological Societies of London and Scotland elected him member. Mr. Prince's contributions to the literature of his subject are largely of a local character, but are of much value for comparative purposes.

BENJAMIN VINCENT.—Long the Keeper of the Royal Institution Library, Mr. Benjn. Vincent first became connected with the Institution in 1848, as Assistant Secretary. In his various capacities he had met most persons of consequence in the World of Science, and was connected with Michael Faraday by marriage. He possessed a remarkable aptitude for languages. Mr. Vincent was editor of Haydn's "Dictionary of Dates" and a companion "Dictionary of Biography." He retired from active attention to the Library in 1889, and died at Barnsbury on the 3rd of May.

HENRY BENDELACK HEWETSON.—Mr. Hewetson, who died at the age of 49, in the second week in May, was a well-known scientific man at Leeds. He was a Fellow of the Royal Geographical, the Linnean, and Zoological Societies; also a member of the British Ornithological Union. He was an artist of repute, and an active supporter of several scientific and artistic societies of Leeds. By profession Mr. Hewetson was a surgeon, devoting his greatest attention to ophthalmic and aural cases. Only a few weeks ago a remarkable case of his was reported, when he enabled a woman to regain her sight, after being blind for 30 years.

HERBERT LLOYD.—A proprietor of Lloyd's Weekly News and Daily Chronicle, died at Falmouth, aged 41. While residing in Natal he was honorary Astronomer at the Observatory.

SCIENCE GOSSIP.

THE new Museum of Oceanography at Monaco is in process of building, the foundation stone having been laid with ceremony on April 25th. There will be laboratories for marine zoologists.

THE aluminium steerable balloon which is being constructed at Marzell, in Germany, is expected to make its first ascent in July next. The site chosen is at Lake Constance, where a platform of pontoons has been built on the lake, to facilitate the operations.

AT a meeting held recently of "The National Trust for Places of Historic Interest and Natural Beauty," the acquisition of a small portion of Wicken Fen was announced. The matter is being arranged for the Committee by Mr. Herbert Goss, F.L.S., whose article on the subject (S.G., vol. v., N.S., p. 291), appears to have influenced the Executive Committee of the National Trust.

AMONG the last official duties performed by Sir William Flowers before his retirement, was that of passing for press the final volume of the "British Museum Catalogue of Birds." This issue of volume xxvi. completes the series as designed by Dr. Gunther so long ago as 1874. It was originally intended that Dr. Bowdler Sharpe should undertake the whole of the work, but owing to his increasing curatorial duties, this was found impossible after the publication of the first four volumes, and he received the assistance of ten other gentlemen. Amongst these were the late Mr. Seebohm, Mr. P. L. Sclater, and Mr. E. Hartert. The "Catalogue" aims at being a complete list of every bird known at the time of publication. Preparations are now being made for a catalogue of the vast collection of eggs in the British Museum. The work has been placed in the hands of the well-known ornithologist, Mr. E. W. Oates.

A SMALL committee, consisting of Sir John Kirk, Sir William Thiselton-Dyer, Dr. Sclater, Dr. Boulenger, and Professor Ray Lankester, have sent Mr. J. E. S. Moore again to Lake Tanganyika to thoroughly explore its depths, and the surrounding country. The Royal Geographical Society and the Royal Society have both contributed funds towards the cost of this expedition. The collections obtained will be placed at the disposal of the Trustees of the British Museum.

ON Saturday, April 15th, a party of about sixty members of the Selborne Society Field Club and friends, met at South Croydon for a ramble over Croham Hurst. A halt was made on the top of the Hurst, when the conductor, Mr. E. A. Martin, F.G.S., addressed those present on the geological and other characteristics of the spot, also dealing with the agitation for preventing the sale of a great part of the site for building purposes. On April 6th, under the guidance of Mr. Harrison, members met at Gomshall for a walk in that very interesting part of Surrey. After an enjoyable ramble in the varied scenery lying between the chalk hills on the north and the sandstone hills on the south, the party took tea at West Hackhurst, the residence of Miss Forster, the local honorary secretary.

CORRESPONDENCE.

AT the suggestion of several correspondents we open with this volume a department in which our readers may address the Editor in letter form. We have pleasure in inviting any who desire to raise discussions on scientific subjects, to address their letters to the Editor, at 110, Strand, London, W.C. Our only restriction will be, in case the correspondence exceeds the bounds of courtesy; which we trust is a matter of great improbability. These letters may be anonymous. In that case they must be accompanied by the full name and address of the writer, not for publication, but as an earnest of good faith. The Editor does not hold himself responsible for the opinions of the correspondents.—*Ed. S.-G.*

PEARSON'S HEPATICAE.

To the Editor of SCIENCE-GOSSIP.

SIR,—The announcement of Pearson's Hepaticae produces a feeling of profound disappointment among a large number of botanists. Anyone not having seen proofs cannot pronounce an opinion on the value of the work, and, it may be reasonably assumed that it will be worth the price charged; but that price is prohibitive. The increasing circle of moss lovers embraces few, probably not any, who do not feel an interest also in the allied hepatics. When it became known that a work on the subject was in preparation by a gentleman eminently capable of dealing with it, hopes were raised; but how many will be able to afford seven pounds for an account of a group of plants numbering two hundred and odd species?

It would be impertinent for an outsider to offer suggestions, but one may venture respectfully to put the matter with an example. There now exist facilities for a fairly comprehensive study of the mosses without the possession of Dr. Braithwaite's "British Moss Flora;" but supposing that splendid monograph were being introduced at the present time, or that the back numbers were to be obtained, it is probable that all students of bryology, without exception, who could afford the expense, would purchase his work. In the same way, had the hepatics been equally accessible, there is little doubt the monograph in question would be obtained by all whose means are commensurate with their enthusiasm. I do not ignore Mr. M. C. Cooke's useful little book, but the price is too small to admit of more than it contains.

The foregoing remarks must not be regarded as a grumble, nothing could be further from the writer's intention, but that they express the sentiments of other botanists as well as himself is already an ascertained fact.

W. P. HAMILTON.

1, Underdale Villas, Shrewsbury.
May 11th, 1899.

SCIENCE EXCURSIONS.

To the Editor of SCIENCE-GOSSIP.

SIR,—It has often occurred to me there are in this country a number of persons interested in some branch of natural science who have the reputation of insularity, for the simple reason they have never had an opportunity of studying Nature beyond their own shores. Could not some arrangement be started for occasional tours to well-known European collecting grounds under the "Personally Conducted" System? I feel sure there are many entomologists, botanists, and others, who are familiar with such places and would gladly take charge of a party once a year. These trips need not be expensive, if an honorary secretary and treasurer would volunteer to organise them.

ESSEX NATURALIST.

NOTICES OF SOCIETIES.

Ordinary meetings are marked +, excursions °; names of persons following excursions are of Conductors. ⌇ Lantern Illustrations.

GEOLOGISTS' ASSOCIATION OF LONDON. *Excursions.*

June 3.—°Redhill.
,, 10.—°Rickmansworth and Harefield. W. Whittaker, B.A., F.R.S., Pres. G.S.
,, 17.—Excursion. Prof. C. Lapworth, LL.D., F.R.S., and Prof. W. W. Watts, M.A., F.G.S.
,, 24.—Brighton. H. Edmunds, B.Sc.
July 1.—°Medway Valley. G. E. Dibley, F.G.S., and A. E. Salter, B.Sc., F.G.S.
,, 15.—°Guildford.
,, 22.—Cycling Excursion.
Aug. 3-9.—°Derbyshire: Peak Forest—Headquarters at Matlock Bath. One night at Castleton. H. Arnold Bemrose, M.A., F.G.S., Dr. Wheelton Hind, F.G.S., and J. Shipman, F.G.S.

Frederick Meeson, Chairman, Excursions Committee, 29, *Thurloe Place, South Kensington, S.W.*

NORTH LONDON NATURAL HISTORY SOCIETY.

June 1.—+"Some Old Microscopists and their Work." W. H. Barber.
,, 15.—+"Evolution of Scenery." R. W. Robbins.
,, 24.—°Chesham. L. B. Prout, F.E.S.

SELBORNE SOCIETY—CROYDON AND NORWOOD BRANCH.

June 17.—°Merstham and Caterham.
July 15.—°Reigate Heath.
Aug. 19.—°Belmont, Woodmansterne, and Chipstead.
Sep. 16.—°Mitcham Common to River Wandle.

SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.

June 10.—°Field Meeting at Byfleet.
July 15.—°Field Meeting at Wisley, *via* Effingham.

Hy. J. Turner, Hon. Report Sec.

HULL SCIENTIFIC AND FIELD NATURALISTS' CLUB.

June 3.—°North Cave and Cliff, with Hull Geological Society.
,, 10.—°Yorkshire Naturalists' Union at Tadcaster.
,, 14.—°⌇Lecture, "The Geology of the Brough neighbourhood." T. Sheppard.
,, 24.—°Day Excursion to Spurn Point.
,, 28.—+⌇"Evidences in Man of Evolution." Dr. J. Hollingworth.
July 8.—°Yorkshire Naturalists' Union at Driffield.
,, 12.—+"A Search for the Red Deer in the Holderness Peat Beds." A. & B. Morfitt.
,, 26.—+"Advice to Young Microscopists." R. H. Philip.

NOTTINGHAM NATURAL SCIENCE RAMBLING CLUB.

June 3.—°Botanical Section. Bulwell Forest.
,, 17.—°Geological Section. Gotham and East Leake. J. Shipman, F.G.S.

TUNBRIDGE WELLS NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

June 3.—°Bodiam Castle. Dr. Earle.
,, 24.—°Heathfield Natural Gas Springs. G. Abbott.
July 15.—°Westerham and District. Mr. Trollope.
Aug. 12.—°Bidborough and Leigh (with Southborough Field Club). Mr. Freer.
Sept. 2.—°Pembury and the Borough Waterworks. H. S. Roberton.
,, 30.—(?)°Fungus Foray. R. R. Hutchinson.

Hon. Sec., R. R. Hutchinson, 28, Princes Street,

SOUTH-EASTERN UNION SCIENTIFIC SOCIETIES.—ANNUAL CONGRESS AT ROCHESTER.

May 25.—†Presidential Address.
,, 26.—†11 a.m. to 1 p.m. General Meeting, papers on "Plateau Implements" by B. Harrison; "Practical Hints on Formation of Collection of Coleoptera," by J. J. Walker, R.N., F.E.S.; "The Sun Eclipse of May, 28th, 1900," by G. F. Chambers, F.R.A.S.
,, 26.—†3 to 5 p.m. "Botanical Bibliography of S.E. Counties," by Prof. G. S. Boulger; "History of the 'Rochester Naturalist,'" by J. Hepworth; "Discussion on Ideals of Natural History Societies," opened by Paul Mathews, M.A.
,, 26.—†Evening. Annual Conversazione of Rochester Naturalists' Club.
,, 27.—†11.30 a.m. "How to Keep a Botanical Record," by Prof. Boulger; "Some English Vegetable Galls," by Edward Connold; "Science at end of 18th Century," by A. W. Blackett.
,, 27.—Excursions to various places at or near Rochester.

Local Secretary, J. Hepworth, Linden House, Rochester.

IMPORTANT NOTICE.

SUBSCRIPTIONS (6s. 6d.) for Vol. VI. are now due. The postage of SCIENCE-GOSSIP is really one penny, but only half that rate is charged to subscribers.

The Proprietor of SCIENCE-GOSSIP having decided to manage the business department from an independent office at 110, Strand, London, W.C., all subscriptions, advertisements and payment for advertisements must in future be sent to that address, and no longer to the Nassau Press, which latterly managed the commercial department for the proprietor.

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—SCIENCE-GOSSIP is published on the 25th of each month. All notes or other communications should reach us not later than the 18th of the month for insertion in the following number. No communications can be inserted or noticed without full name and address of writer. Notices of changes of address admitted free.

BUSINESS COMMUNICATIONS.—All Business communications relating to SCIENCE-GOSSIP must be addressed to the Proprietor of SCIENCE-GOSSIP, 110, Strand, London.

SUBSCRIPTIONS.—Subscriptions to SCIENCE-GOSSIP, which may commence with any number, at the rate of 6s. 6d. for twelve months (including postage), should be remitted to the Office, 110, Strand, London, W.C.

EDITORIAL COMMUNICATIONS, articles, books for review, instruments for notice, specimens for identification, &c., to be addressed to JOHN T. CARRINGTON, 110, Strand, London, W.C.

NOTICE.—Contributors are requested to strictly observe the following rules. All contributions must be *clearly* written on one side of the paper only. Words intended to be printed in *italics* should be marked under with a single line. Generic names must be given in full, excepting where used immediately before. Capitals may only be used for generic, and not specific names. Scientific names and names of places to be written in round hand.

THE Editor will be pleased to answer questions and name specimens through the Correspondence column of the magazine. Specimens, in good condition, of not more than three species to be sent at one time, *carriage paid*. Duplicates only to be sent, which will not be returned. The specimens must have identifying numbers attached, together with locality, date, and particulars of capture.

THE Editor is not responsible for unused MSS., neither can he undertake to return them, unless accompanied with stamps for return postage.

EXCHANGES.

NOTICE.—Exchanges extending to thirty words (including name and address) admitted free, but additional words must be prepaid at the rate of threepence for every seven words or less.

SCIENCE-GOSSIP, vol. xxviii. (1892). "Photogram," vol. ii. "Amateur Photographer," vol. xvi. All unbound. Offered.—Charles Mosley, Lockwood, Huddersfield.

SCIENCE-GOSSIP, 1886-8, complete. Jan., 1889, Aug., Nov., Dec., 1895; Jan., Feb., July, Aug., Sep., Oct., Dec., 1896. What offers in foreign shells.—Ernest Pattison, 52, Regent Road, Leicester.

POWERFUL BINOCULAR field glass, with sling case, as new, Wanted.—Good low-power microscope (for opaque objects); dissecting microscope; or offers (Natural History).—Burgess Sopp, Saxholme, Hoylake.

WANTED, elementary science books. Offer English or foreign books in exchange, Miss Inman, Halstead, Essex.

COLLECTION BIRDS' EGGS. Few sea-birds included, open to offer. Particulars from Charles Bowell, junior, Conway House, Allandale Road, Leicester.

OFFERED, many back volumes. SCIENCE-GOSSIP, "Entomologist," "Entomologists' Record," "Entomologists' Monthly Magazine," "Naturalist," "Zoologist," "Ornithologist," and "Oologist," etc. Wanted, works on entomology or offers. W. Banks, Union Road, Poole, Dorsetshire.

WANTED, Gosse's Manual of Marine Zoology, 2 Vols. State particulars and price, R. Williamson, 3, Keir Street, Pollokshields, Glasgow.

OFFERED, new Geological Map of British Isles, by A. Geikie, F.R.S., mounted mahogany rollers, with illustrations fossils. Geological Text-book Wanted, also Botanical.—P. J. Roberts, 11, Back Ash Street, Bacup.

SPIDERS. Few days' loan of collection of Arachnidae required for sketching purposes. Will exchange vols. of "Strand Magazine" or cash payment.—James Scott, 241, Edward Road, Walthamstow.

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